Comm'n, 939 F.2d 1047, 1049 n.1 (D.C. Cir. 1991), one who comments on another's petition for a rulemaking or declaratory ruling has "present[ed] its view to the agency [so as] to qualify as a 'party,'" *S. Pac. Transp. Co. v. ICC*, 69 F.3d 583, 588 (D.C. Cir. 1995)—at least insofar as the issues appealed were also taken up by the petitioner below (as they were here). Rite Aid afforded the Commission an opportunity to consider its position on the Association's exemption request. We therefore proceed to the substance of Rite Aid's challenge.

2.

Rite Aid contends that, "[b]y restricting otherwise permissible HIPAA communications," the Declaratory Ruling "conflicts with another federal law." Rite Aid Br. 12 (quoting *NextWave Pers. Commc'ns, Inc. v. FCC*, 254 F.3d 130, 149 (D.C. Cir. 2001)). It essentially argues that *any* partial exemption of healthcare-related communications would have been unlawful, because HIPAA—the exclusive source of federal law on the disclosure of protected health information—operates of its own force to supersede any TCPA prohibition on healthcare calls. Rite-Aid is incorrect. There is no obstacle to complying with both the TCPA and HIPAA; "[t]he two statutes provide separate protections." *Mais v. Gulf Coast Collection Bureau, Inc.*, 768 F.3d 1110, 1125 (11th Cir. 2014).

Under HIPAA regulations, covered entities and their business associates presumptively "may not use or disclose protected health information." 45 C.F.R. § 164.502(a). But they *are* generally permitted to use or disclose that information "for treatment, payment, or health care operations." *Id.* § 164.506(a). Rite Aid complains that the partial exemption granted in the Declaratory Ruling conflicts

with HIPAA because it stops short of exempting billing- and account-related communications—i.e., ones "for . . . payment." *Id.* But all that § 164.506(a)'s exclusion does is to carve out an exception to civil and criminal liability for using or disclosing protected health information. *See* 42 U.S.C. §§ 1320d-5, 1320d-6. It says nothing about the Commission's authority to exempt (or refrain from exempting) certain kinds of calls from the TCPA's consent requirement.

In confining the use of its exemption authority, the Commission did not restrict communications that HIPAA requires be permitted to flow freely. It simply declined to make certain exchanges even less burdensome than they would have been by default. If Rite Aid were correct, healthcare providers could use ATDS equipment to bombard nonconsenting wireless users with calls and texts concerning outstanding charges without incurring TCPA liability. Nothing in HIPAA commands such a result, and we see no basis to interpret it to frustrate the TCPA in that way.

3.

Finally, Rite Aid contends that the Declaratory Ruling's exemption for certain healthcare calls is arbitrary and capricious. Neither of its suggested grounds is persuasive.

a. Rite Aid first argues that the Commission failed to explain its purported departure from its earlier practice of exempting HIPAA-protected communications. In addition to its restrictions on calls to wireless numbers, the TCPA also forbids the use of an ATDS "to initiate any telephone call to any *residential* telephone line using an artificial or prerecorded voice to deliver a message without the prior express consent of the called party," unless one of three

exceptions applies. 47 U.S.C. § 227(b)(1)(B) (emphasis added).

In a 2012 Order, the Commission exempted from that consent requirement "prerecorded health care-related calls to residential lines, which are already regulated by" HIPAA. In re Rules and Regulations Implementing the Telephone Consumer Protection Act of 1991 (2012 Order), 27 FCC Rcd. 1830, 1837 ¶ 18 (2012). Some parts of the Order suggested that its exemption reached no further than the one granted in 2015's Declaratory Ruling for calls to wireless numbers. Exempted calls were described as "promot[ing] important communications . . . such as prescription refills and immunization reminders," *id.* at 1855 ¶ 63 n.192, and "concern[ing] consumers' health, not the purchase of a good or service," *id.* at 1856 ¶ 63 n.195. But the Order elsewhere characterized its exemption as covering "*all* prerecorded health care-related calls to residential lines *that are subject to HIPAA*." *Id.* at 1852 ¶ 57 (emphases added).

The 2012 Order's exemption was codified in 47 C.F.R. § 64.1200(a)(3)(v). That regulation did not use the phrase "health care-related call[]," but instead referred to "'health care' message . . . [as] defined in the HIPAA Privacy Rule, 45 C.F.R. § 160.103." 47 C.F.R. § 64.1200(a)(3)(v). Likewise, § 160.103 does not mention the term "health care message." But it does define "health care" as "care, services, or supplies related to the health of an individual." 45 C.F.R. § 160.103. That term includes, among many other things, "[s]ale or dispensing of a drug, device, equipment, or other item in accordance with a prescription." *Id.* A "'health care' message" is presumably a message pertaining to any of the topics that "health care" is defined to include. We assume for present purposes that some calls concerning the "[s]ale . . . of a drug . . . in accordance with a prescription" would relate to

"billing," which the 2015 Declaratory Ruling did not exempt from the consent requirement.

Rite Aid is therefore correct that, in one sense, the 2012 exemption swept more broadly than the 2015 version. We also accept that the 2012 Order cited a number of "technology-agnostic justifications" for exempting all prerecorded healthcare-related calls subject to HIPAA and made to residential lines. Rite Aid Br. 5. For example, the Commission believed that such calls "ensure continued customer access to health care-related information" and would not lead to "coercive or abusive" interactions. 2012 Order, 27 FCC Rcd. at 1853-54 ¶¶ 59-60.

The relevant question is whether the Commission acted arbitrarily and capriciously in affording a narrower exemption for healthcare-related calls made to *wireless* numbers. We find that it did not. Even if one might hypothesize "important reasons for treating residential and wireless telephone lines the same," Rite Aid Br. 9, the TCPA itself presupposes the contrary—that calls to residential and wireless numbers warrant differential treatment.

Unlike with the autodialer restrictions on calls to wireless numbers, callers are free to use ATDS equipment to dial residential lines as long as no "artificial or prerecorded voice" is used. 47 U.S.C. § 227(b)(1)(B). The statute itself contemplates that calls to wireless numbers "tread [more] heavily upon . . . consumer privacy interests." 2012 Order, 27 FCC Rcd. at 1855 ¶ 63. That concern directly informed the 2015 exemption's scope: the Commission concluded that messages "not critical to a called party's healthcare . . . do not justify setting aside a consumer's privacy interests." 2015 Declaratory Ruling, 30 FCC Rcd. at 8031 ¶ 146.

In short, there is nothing inherently contradictory about easing restrictions on certain kinds of calls to landlines, but not to cellular phones. And Rite Aid fails to mention another variable that confounds direct comparisons between the two exemptions. As codified, the 2012 exemption applies only to calls that "us[e] an artificial or prerecorded voice to deliver a message," 47 C.F.R. § 64.1200(a)(3); the Declaratory Ruling's exemption is not so limited. We therefore reject Rite Aid's first arbitrary-and-capricious challenge.

b. Lastly, Rite Aid argues that the Commission acted arbitrarily by failing to recognize that *all* healthcare-related calls satisfy the TCPA's "emergency purposes" exception to the consent requirement. As used in the Act, "[t]he term emergency purposes means calls made necessary in any situation affecting the health and safety of consumers." 47 C.F.R. § 64.1200(f)(4). But Rite Aid identifies no calls satisfying that exception that were not already subject to the 2015 exemption. It would be implausible to conclude that calls concerning "telemarking, solicitation, or advertising content, or which include accounting, billing, debt-collection, or other financial content" are made for "emergency purposes." 2015 Declaratory Ruling, 30 FCC Rcd. at 8031 ¶ 146. Even if accounting systems are in some sense "necessary" to the continued provision of healthcare, "[t]imely delivery of these types of messages is not *critical*" to that goal. *Id.* (emphasis added).

In marked contrast, the Commission recently exempted calls concerning certain time-sensitive risks to students' health and safety in the school setting. That list of scenarios included "weather closures, fire, . . . threats," "dangerous persons, health risks (e.g., toxic spills), and unexcused absences." In re Rules and Regulations Implementing the Telephone Consumer Protection Act of 1991, 31 FCC Rcd.

9054, 9061 ¶ 17, 9063 ¶ 21 (2016). In declining a request to interpret the emergency-purposes exception far more expansively, we are guided by its role in the statutory scheme. Consumers may find themselves wholly unable to stave off calls satisfying the exception. That is because, by definition, such calls fall outside the TCPA's consent framework; callers can make them even if recipients are known to object. Advertisements, solicitations, and post-treatment financial communications do not arise from the sorts of "emergencies" that would justify suspending the TCPA's consent regime.

The Commission was empowered to draw the distinction it did, and it adequately explained its reasons for doing so. We therefore reject Rite Aid's arbitrary-and-capricious challenge.

* * * * *

For the foregoing reasons, we grant in part and deny in part the petitions for review.

So ordered.

ORIGINAL

No. 15-1211 (and consolidated cases)

IN THE UNITED STATES COURT OF APPEALS
FOR THE DISTRICT OF COLUMBIA CIRCUIT

ACA INTERNATIONAL,

Petitioner,

v.

FEDERAL COMMUNICATIONS COMMISSION,

Respondent.

REQUESTS FOR JUDICIAL NOTICE

Charles R. Messer (California State Bar no. 101094)
CARLSON & MESSER LLP
5959 West Century Boulevard, Suite 1214
Los Angeles, California 90045
Telephone: (310) 242-2202
messerc@cmtlaw.com

Amicus Curiae Charles R. Messer, pro se

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Charles R. Messer (California State Bar no. 101094)
CARLSON & MESSER LLP
5959 West Century Boulevard, Suite 1214
Los Angeles, California 90045
Telephone: (310) 242-2202
messerc@cmtlaw.com

Amicus Curiae Charles R. Messer, pro se

1. Requests for Judicial Notice.

Pursuant to Rules 201, 803(16), and 1011 of the Federal Rules of Evidence, the court should take judicial notice of documents and facts that are relevant to petitioner ACA International's Statement of Issues no. 1: "The Federal Communications Commission's attempted redefinition of 'automatic telephone dialing system' under the Telephone Consumer Protection Act—including but not limited to....its treatment of predictive dialers---is arbitrary, capricious, an abuse of discretion, and not in accordance with law...." (See Document #1567590).

2. Documents to be judicially noticed.

The court should take judicial notice of the three United States Patents attached to these Requests for Judicial Notice, which are cited in the Amicus Brief of Charles R. Messer (see Document #1587860), as follows:

a. United States Patent no. 3,989,899 for a Telephone Scheduling System, filed on April 8, 1975 and issued on November 2, 1976. This patent is relevant to prove that the technology by which auto-dialers called telephone numbers that were stored in (and retrieved from) databases was invented before the TCPA was enacted in 1991.

b. United States Patent no. 4,599,493 for a Multi-Line Telephone Control System was filed on August 28, 1984 and was issued on July 8, 1986. This is one of Ellis Cave's patents for an improved predictive auto-dialer that called telephone numbers that were stored in (and retrieved from) databases. This patent is relevant to prove that predictive auto-dialers were invented and utilized before the TCPA was enacted in 1991.

c. United States Patent no. 4,933,964 for a Pacing of Telephone Calls for Call Origination Management Systems was filed on July 25, 1989 and was issued

on June 12, 1990. This patent is relevant to prove that predictive auto-dialers were invented and utilized before the TCPA was enacted in 1991.

3. **Facts to be judicially noticed.**

The court should take judicial notice of these facts:

a. By July 1989, predictive auto-dialers that called telephone numbers that were stored in and retrieved from databases were widely used by a variety of businesses, groups and organizations.

b. By July 1989, predictive auto-dialers that called telephone numbers that were stored in and retrieved from databases were used by banks and creditors for debt collection.

c. By July 1989, predictive auto-dialers that called telephone numbers that were stored in and retrieved from databases were used by publishers to solicit subscriptions.

d. By July 1989, predictive auto-dialers that called telephone numbers that were stored in and retrieved from databases were used by charitable and political organizations to promote their causes and solicit funds.

4. **Judicial notice is always timely.**

The Federal Rules of Evidence, "apply to proceedings before United States courts of appeal." Federal Rule of Evidence 1011.

"The court may take judicial notice at any stage of the proceeding." Federal Rule of Evidence 201(d).

5. The documents and facts are admissible.

"The following are not excluded by the rule against hearsay, regardless of whether the declarant is available as a witness....

(16) Statements in Ancient Documents. A statement in a document that is at least 20 years old and whose authenticity is established."

Federal Rule of Evidence 803(16).

The authenticity of the documents which are identified in Section 2, above, and are attached, can be established or verified through the Patent Office's website.

The facts in Section 3, above, are from statements in U.S. Patent no. 4,933,964. Under Rule 803(16), those statements are admissible because they are more than 20 years old.

6. Respondents are entitled to be heard.

Respondents Federal Communication Commission and the United States of America are entitled to be heard about the propriety of these Requests, documents and facts:

(e) Opportunity to Be Heard. On timely request, a party is entitled to be heard on the propriety of taking judicial notice and the nature of the fact to be noticed. If the court takes judicial notice before notifying a party, the party, on request, is still entitled to be heard.

Federal Rule of Evidence 201(e).

The court should require the respondents to respond to these Requests, documents, and facts by January 15, 2016.

7. Conclusion.

The FCC's ATDS Rules are based on the Commission's false claims that new auto-dialer technologies were developed after the TCPA was enacted in 1991.

The court should take judicial notice of the documents and facts identified above, and the court should order the respondents to respond to these Requests, documents, and facts by January 15, 2016.

Dated: December 22, 2015 Respectfully submitted,

CARLSON & MESSER LLP

By: _____

Charles R. Messer
California State Bar no. 101094
CARLSON & MESSER LLP
5959 W Century Boulevard, Suite 1214
Los Angeles, California 90045
(310) 242-2202
messerc@cmtlaw.com
Amicus Curiae Charles R. Messer, pro se

CERTIFICATE OF SERVICE

I hereby certify that a true and accurate copy of these Requests for Judicial Notice was served upon all counsel via mail and/or email on this twenty-third day of December, 2015:

Brian Ross Melendez, Attorney
Direct: 612-486-1589
Email: bmelendez@dykema.com
Fax: 866-637-2804
[COR NTC Retained]
Dykema Gossett PLLC
Firm: 612-486-1900
4000 Wells Fargo Center
90 South Seventh Street
Minneapolis, MN 55402-3903
[By Mail and Email]

Scott Matthew Noveck, Counsel
Direct: 202-418-7294
Email: scott.noveck@fcc.gov
[COR LD NTC Gvt US Agency]
Federal Communications Commission
(FCC) Office of General Counsel
Firm: 202-418-1720
445 12th Street, SW
Washington, DC 20554
[By Mail and Email]

Richard Kiser Welch, Deputy Associate General Counsel
Direct: 202-418-7225
Email: Richard.Welch@fcc.gov
Fax: 202-418-2819
[COR LD NTC Gvt US Agency]
Federal Communications Commission
(FCC) Office of General Counsel
Room 8-A765
Firm: 202-418-1720
445 12th Street, SW
Washington, DC 20554
[By Mail and Email]

Jacob M. Lewis, Associate General Counsel
Direct: 202-418-1700
Email: jacob.lewis@fcc.gov
Fax: 202-418-2822
[COR NTC Gvt US Agency]
Federal Communications Commission
(FCC) Office of General Counsel
8th Floor
Firm: 202-418-1720
445 12th Street, SW
Washington, DC 20554
[By Mail and Email]

Steven Jeffrey Mintz, Esquire, Attorney
Direct: 202-353-0256
Email: steven.mintz@usdoj.gov
Fax: 202-514-0536
[COR LD NTC Gvt US DOJ]
U.S. Department of Justice
(DOJ) Antitrust Division
950 Pennsylvania Avenue, NW
Washington, DC 20530-0000
[By Mail and Email]

Kristen Ceara Limarzi
Direct: 202-353-8629
Email: kristen.limarzi@usdoj.gov
Fax: 202-514-0536
[COR NTC Gvt US DOJ]
U.S. Department of Justice
(DOJ) Antitrust Division, Appellate Section
3224
Firm: 202-514-2413
950 Pennsylvania Avenue, NW
Washington, DC 20530-0001
[By Mail and Email]

Thomas Collier Mugavero
Direct: 703-280-9260
Email: tmugavero@wtplaw.com
Fax: 703-280-8948
[COR LD NTC Retained]
Whiteford Taylor & Preston, LLP
Firm: 703-836-5742
3190 Fairview Park Drive
Suite 300
Falls Church, VA 22042
[By Email]

Jonathan Goldman Cedarbaum
Direct: 202-663-6315
Email: jonathan.cedarbaum@wilmerhale.com
[COR LD NTC Retained]
Wilmer Cutler Pickering Hale and Dorr LLP
Firm: 202-663-6000
1875 Pennsylvania Avenue, NW
Washington, DC 20006-1420
[By Email]

Jonathan Edward Paikin
Direct: 202-663-6703
Email: jonathan.paikin@wilmerhale.com
Fax: 202-663-6363
[COR LD NTC Retained]
Wilmer Cutler Pickering Hale and Dorr LLP
Firm: 202-663-6000
1875 Pennsylvania Avenue, NW
Washington, DC 20006-1420
[By Email]

Steven A. Augustino, Esquire, Attorney
Direct: 202-342-8400
Email: saugustino@kelleydrye.com
Fax: 202-342-8451
[COR LD NTC Retained]
Kelley Drye & Warren LLP
Firm: 202-342-8400
3050 K Street, NW
Suite 400
Washington, DC 20007
[By Email]

Bryan Kyle Clark, Attorney
Direct: 312-609-7810
Email: bclark@vedderprice.com
[COR LD NTC Retained]
Vedder Price, PC
Firm: 312-609-7500
222 North La Salle Street
Suite 2600
Chicago, IL 60601
[By Email]

Blaine Christopher Kimrey, Attorney
Direct: 312-609-7500
Email: bkimrey@vedderprice.com
Fax: 312-609-5005
[COR LD NTC Retained]
Vedder Price, PC
Firm: 312-609-7500
222 North La Salle Street
Suite 2600
Chicago, IL 60601
[By Email]

Russell Paul Hanser
Direct: 202-383-3408
Email: rhanser@wbklaw.com
[COR NTC Retained]
Wilkinson Barker Knauer, LLP
Firm: 202-783-4141
1800 M Street, NW
Suite 800N
Washington, DC 20036
[By Email]

Bryan Nicholas Tramont
Direct: 202-783-4141
Email: btramont@wbklaw.com
Fax: 202-783-5851
[COR NTC Retained]
Wilkinson Barker Knauer, LLP
Firm: 202-783-4141
1800 M Street, NW
Suite 800N
Washington, DC 20036
[By Email]

Harvey L. Reiter
Direct: 202-728-3016
Email: harvey.reiter@stinsonleonard.com
Fax: 202-572-9968
[COR LD NTC Retained]
Stinson Leonard Street LLP
Firm: 202-785-9100
1775 Pennsylvania Avenue, NW
Suite 800
Washington, DC 20006-4605
[By Email]

Donald Louis Bell, II, Esquire
Direct: 703-837-4231
Email: dbell@nacds.org
[COR LD NTC Retained]
National Association of Chain Drug Stores
Firm: 703-549-3001
1776 Wilson Boulevard
Suite 200
Arlington, VA 22209
[By Email]

Devin Scott Anderson
Direct: 202-879-5198
Email: devin.anderson@kirkland.com
[COR LD NTC Retained]
Kirkland & Ellis LLP
Firm: 202-879-5000
655 15th Street, NW
Suite 1200
Washington, DC 20005
[By Email]

Andrew Brian Clubok
Direct: 202-879-5173
Email: aclubok@kirkland.com
Fax: 202-879-5200
[COR LD NTC Retained]
Kirkland & Ellis LLP
Firm: 202-879-5000
655 15th Street, NW
Suite 1200
Washington, DC 20005
[By Email]

Joseph R. Palmore
Direct: 202-887-6940
Email: JPalmore@mofo.com
Fax: 202-887-0763
[COR LD NTC Retained]
Morrison & Foerster LLP
Firm: 202-887-1500
2000 Pennsylvania Avenue, NW
Suite 6000
Washington, DC 20006-1888
[By Email]

Craig L. Briskin, Esquire
Email: cbriskin@findjustice.com
[COR LD NTC Retained]
Mehri & Skalet, PLLC
Firm: 202-822-5100
1250 Connecticut Avenue, NW
Suite 300
Washington, DC 20036
[By Email]

Marc Rotenberg
Direct: 202-483-1140
Email: rotenberg@epic.org
Fax: 202-483-1248
[COR LD NTC Retained]
Electronic Privacy Information Center
Firm: 202-483-1140
1718 Connecticut Avenue, NW
Suite 200
Washington, DC 20009
[By Email]

Alan Jay Butler, Senior Counsel
Direct: 202-483-1140
Email: butler@epic.org
Fax: 202-483-1248
[COR NTC Retained]
Electronic Privacy Information Center
Firm: 202-483-1140
1718 Connecticut Avenue, NW
Suite 200
Washington, DC 20009
[By Email]

Amy Marshall Gallegos
Direct: 213-239-5500
Email: agallegos@jenner.com
Fax: 213-239-5199
[COR LD NTC Retained]
Jenner & Block LLP
Firm: 213-239-5100
633 West 5th Street
Suite 3600
Los Angeles, CA 90071
[By Email]

///
///
///
///

Dated: December 23, 2015 CARLSON & MESSER LLP

By: s/ Charles R. Messer

Charles R. Messer
California State Bar no. 101094
CARLSON & MESSER LLP
5959 W Century Boulevard, Suite 1214
Los Angeles, California 90045
(310) 242-2202
messerc@cmtlaw.com
Amicus Curiae Charles R. Messer, pro se

UNITED STATES PATENT

3,989,899

United States Patent [19]

Norwich

[11] **3,989,899**

[45] **Nov. 2, 1976**

[54] TELEPHONE SCHEDULING SYSTEM

[76] Inventor: **Daniel Norwich, 350 N. Palm, Beverly Hills, Calif. 90210**

[22] Filed: **Apr. 8, 1975**

[21] Appl. No.: **566,643**

[52] U.S. Cl. ..... 179/2 DP
[51] Int. Cl.[2] H04M 11/00
[58] Field of Search ..... 179/2 DP

[56] **References Cited**

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3,407,269	10/1968	Brzoska	179/5 R
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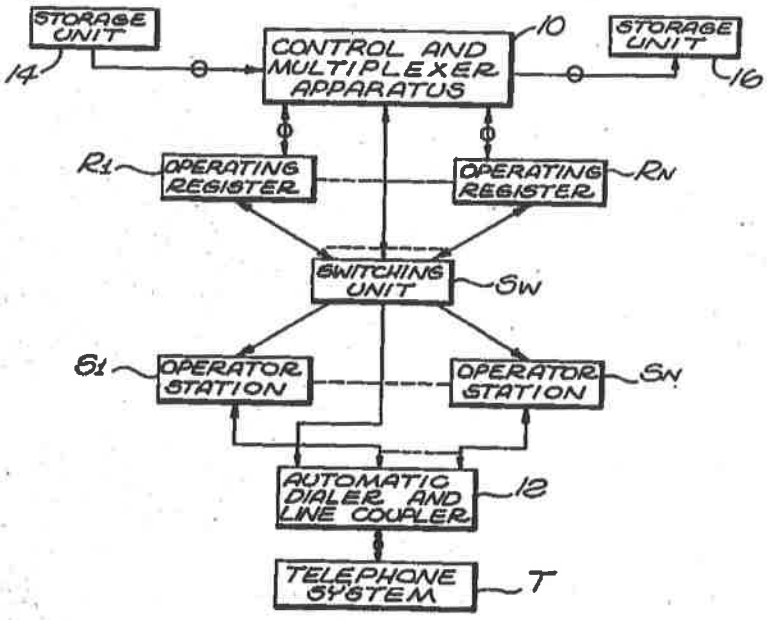
Primary Examiner—George G. Stellar
Attorney, Agent, or Firm—Nilsson, Robbins, Dalgarn & Berliner

[57] **ABSTRACT**

A system is disclosed for use in cooperation with a telephone network to schedule and control telephonic contacts, as from a plurality of calling stations to a number of parties at individual remote stations. Storage means are provided for registering code words (associated with stations that are to be called) along with representations of message information to be conveyed. For example, code words may store representations of: a number for a station to be called, the name of a party to be contacted at the station, a status code and so on.

In the operation of the system, a control unit actuates an automatic dialing unit with a number from storage. Subsequently, the system senses the possible results of dialing a number, i.e. as a busy signal, no answer or a station contact. In the event of a busy signal or no answer, a code word (from storage) may be appropriately modified then stored for use in a subsequent attempt. Upon the occurrence of a contact, connection is made to an operator station and a display unit is actuated to cue the operator with the desired message. The system also incorporates input means for use by the operator to enter information in the code word indicating the results of a call.

8 Claims, 4 Drawing Figures



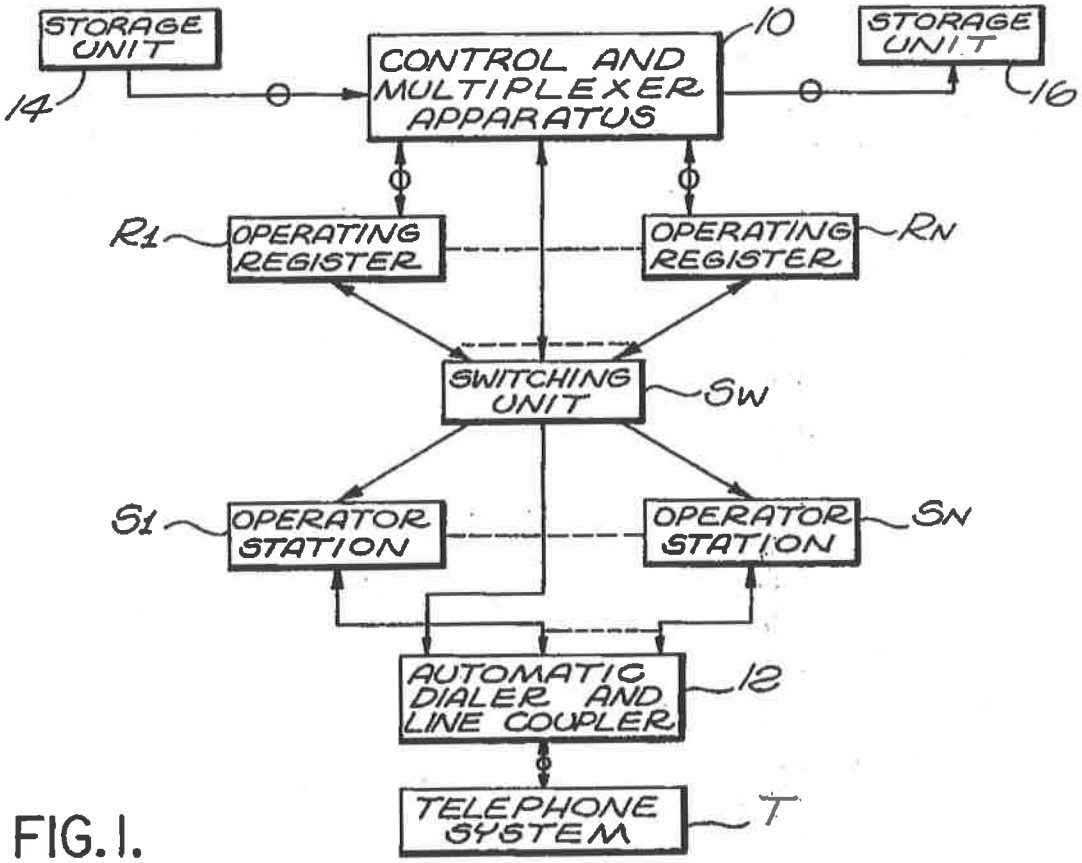

STORAGE UNIT
14
CONTROL AND MULTIPLEXER APPARATUS
10
STORAGE UNIT
16
R1
OPERATING REGISTER
OPERATING REGISTER
RN
SWITCHING UNIT
SW
S1
OPERATOR STATION
OPERATOR STATION
SN
AUTOMATIC DIALER AND LINE COUPLER
12
TELEPHONE SYSTEM
T

FIG. 1.

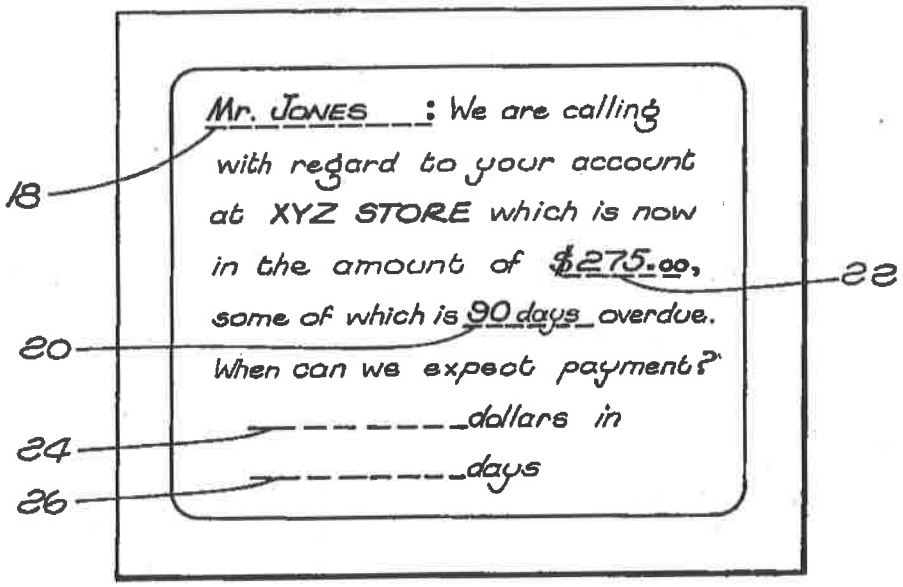

Mr. JONES : We are calling
with regard to your account
at XYZ STORE which is now
in the amount of $275.00,
some of which is 90 days overdue.
When can we expect payment?
_____dollars in
_____days
18
20
22
24
26

FIG. 2.

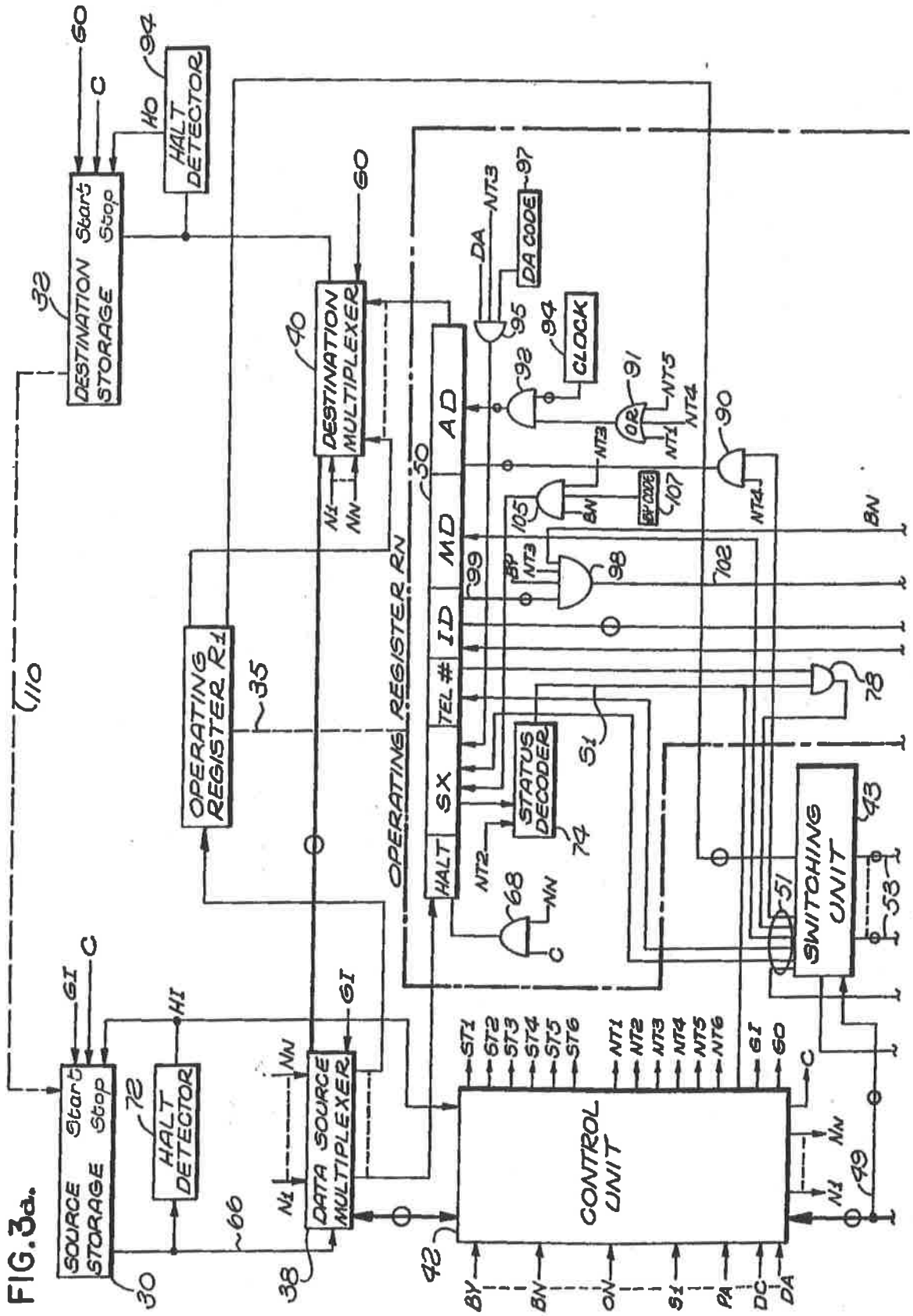

SOURCE STORAGE
Start
Stop
30
HALT DETECTOR
72
66
DATA SOURCE MULTIPLEXER
38
OPERATING REGISTER R1
35
110
DESTINATION STORAGE
32
DESTINATION MULTIPLEXER
40
OPERATING REGISTER RN
AD
MD
ID
TEL #
SX
HALT
STATUS DECODER
74
CONTROL UNIT
42
SWITCHING UNIT
43
CLOCK
94
DA CODE
97
60
94
HALT DETECTOR
C
GI
HI
NN
N1
ST1 ST2 ST3 ST4 ST5 ST6
NT1 NT2 NT3 NT4 NT5 NT6
BY BN ON SI PA DC DA

FIG. 3a.

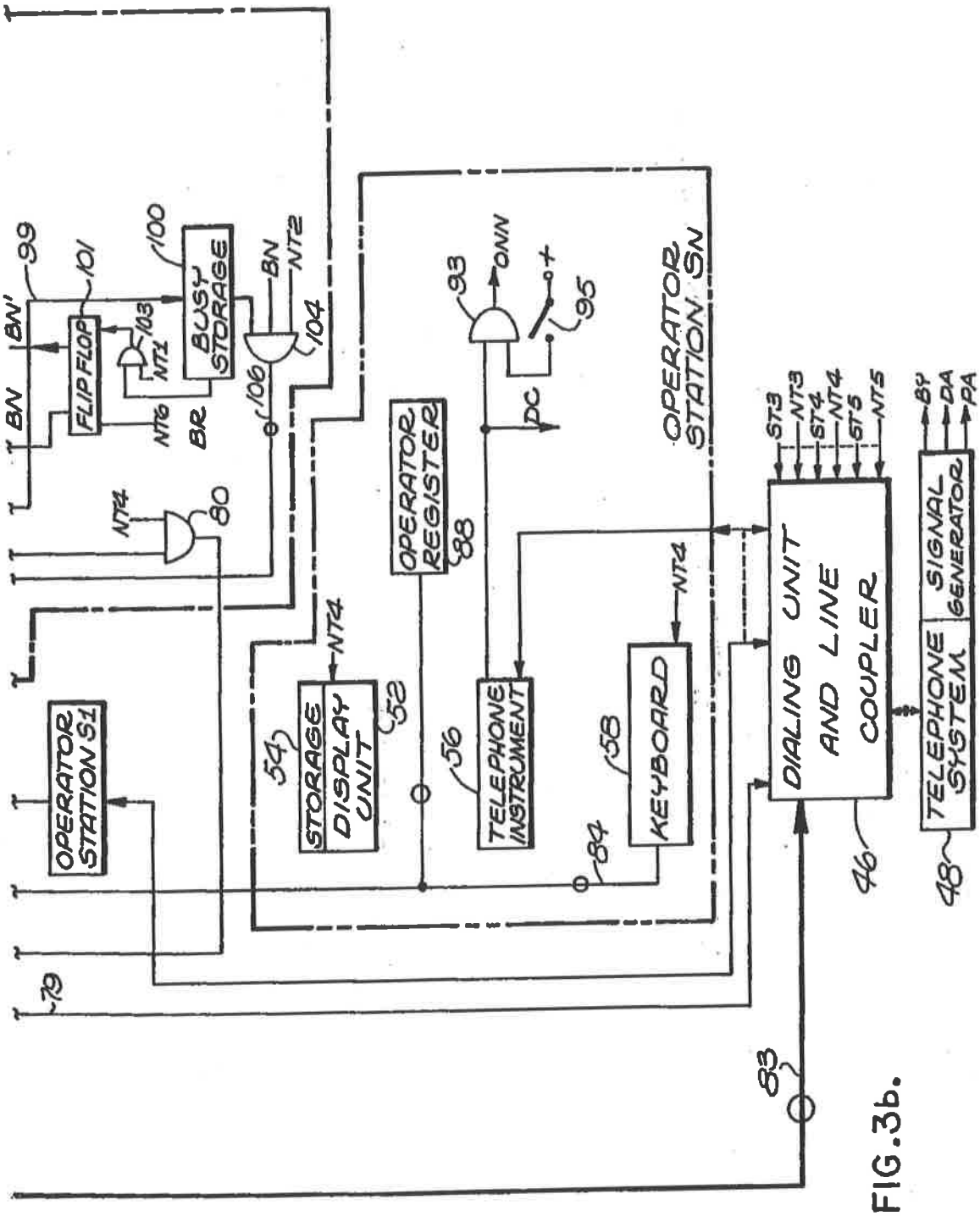

OPERATOR STATION S1
STORAGE DISPLAY UNIT
52
54
NT4
OPERATOR REGISTER
88
TELEPHONE INSTRUMENT
56
KEYBOARD
58
84
NT4
OPERATOR STATION SN
DIALING UNIT AND LINE COUPLER
46
TELEPHONE SYSTEM
SIGNAL GENERATOR
48
ST3
NT3
ST4
NT4
ST5
NT5
BY
DA
PA
79
83
80
NT4
BN
BN'
99
FLIP FLOP
101
103
NT1
NT6
BR
BUSY STORAGE
100
BN
NT2
104
106
93
ONN
95
DC

FIG.3b.

TELEPHONE SCHEDULING SYSTEM

BACKGROUND AND SUMMARY OF THE INVENTION

Economies attendant the use of the telephone, as well as the effectiveness of direct oral communication, have resulted in ever-increasing volumes of telephone traffic. However, as a related consideration, persons who use the telephone extensively normally spend a considerable amount of time unsuccessfully trying to establish telephonic contact, their efforts frequently failing as a result of "busy" or "no answer" situations. The present invention is directed to the recognition of the need for a system to effectively accomplish telephonic contacts, and further, to provide such a system in cooperation with structure for effectively scheduling and processing telephonic contacts.

In general, the system of the present invention should be recognized as having widespread application to solve a variety of telephonic scheduling problems. However, a specific form of system will serve to exemplify the structure and illustrate a typical operating application therefor. In that regard, as an illustrative application for the system, consider an operation in which a number of telephone people work through a substantial list of parties to be contacted, pursuing an oral interchange with each party. Of course, such operations are rather common and might involve such specific objectives as: debt collection, telephone solicitation, information surveys and so on.

Recognizing that several variables are involved, it is not uncommon for persons involved in such telephone work to spend in excess of one-half their time attempting to establish telephone contact with desired parties. Consequently, a substantial fragment of the cost attendant a telephone operation as considered above relates to the burdensome and often unsuccessful effort of establishing contact with desired parties. Accordingly, a considerable need exists for an improved system to reduce the time and effort expended by a person to establish telephonic contact. A further need relates to effectively processing the information resulting from the calls and attempted calls of such efforts.

In general, the present invention may be embodied to effectively schedule and expedite telephone calls, as for one or more telephone workers. Each such worker, i.e. operator, is accommodated at a calling or operating station by a telephone instrument, a display apparatus and an input structure. The system incorporates apparatus for storing: the telephone numbers of stations to be contacted, messages to be communicated, and status codes for the station to be contacted, along with other alternative information in the form of identifications and so on. The system processes such information, seeking to contact each station to be called, and upon each contact, the system alerts a specific operator with a cue for the substance of a message to be communicated. Consequently, the operator is able to concentrate on effective communication. The system may also incorporate means for registering indications of the results of telephonic contacts and attempts to contact.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, which constitute a part of this specification, an exemplary embodiment demonstrating the various objectives and features hereof is set forth as follows:

FIG. 1 is a diagrammatic representation of a system embodied in accordance with the present invention;

FIG. 2 is a plan view of a display unit providing a display in accordance with one mode of operating the system of FIG. 1; and

FIGS. 3*a* and 3*b* together are a block and logic diagram of a detailed system as more generally depicted in FIG. 1.

DESCRIPTION OF ILLUSTRATIVE EMBODIMENT

As indicated above, a detailed illustrative embodiment of the invention is disclosed herein. However, embodiments may be constructed in accordance with various forms, some of which may be rather different from the disclosed illustrative embodiment. Consequently, the specific structural and functional details disclosed herein are merely representative, yet in that regard are deemed to provide the best embodiment for purposes of disclosure and to provide a basis for the claims herein which define the scope of the present invention.

Referring initially to FIG. 1, a telephone system T is depicted as a block (bottom center) and is representative of a typical telephone network incorporating a multitude of instruments located at remote stations, along with facilities for conventional interconnect by dialing or other techniques. A number of "telephone lines" are provided from the system T to a cable, as indicated.

A plurality of operating registers (generally termed R) are represented in FIG. 1 (center) which are specifically designated as registers R1 through RN (only registers R1 and RN being illustrated). Each of the operating registers R may be individually coupled through a switching unit SW to one of a set of operator stations S1 through SN. The operator stations each include a telephone instrument in one form or another, for use in communication with any of a multitude of remote telephone stations represented to be within the telephone system T. Accordingly, operating registers R are coupled to provide telephone numbers to actuate the telephone system T. If a called station answers, the station (from the telephone system T) is coupled to an operator station S which is in turn coupled for communication with the operating register R carrying the called-number data. Accordingly, communication is established independently of direct human effort, after which operators are cued and may record call consequences. The system of the present invention selectively interconnects the operator stations S with a sequential series of telephone stations drawn from a list, so as to schedule and expedite telephonic contact and substantially improve the performance capability of operators active at the stations S.

As indicated in FIG. 1, the operating registers R are connected to a control-and-multiplexer apparatus 10 that is in turn connected to a switching unit SW which is connected to an automatic dialer unit 12 for actuating the telephone system T as well as for coupling operator stations S to specific lines. Essentially, after establishing a data cell in one of the registers R, the apparatus 10 controls the unit SW to actuate the dialer 12, working into a telephone system T so as to sequentially establish contact with desired remote stations for the operator stations S on demand.

The data cells, specifying the stations to be contacted along with other data, are provided from a storage unit 14 (in the form of signal-represented code words) to

the apparatus 10 and after processing are transferred (modified to reflect the occurrence) to a destination storage unit 16. In addition to the storage units 14 and 16, data storage capacity also exists in the registers R and the apparatus 10.

The operator stations S each incorporate display and input facilities. The operator stations S also include a telephone instrument, which may take the form of a head set and a mounted mouthpiece (not shown). Accordingly, the operator may be provided with a visual-display structure for cuing a communication after telephone contact is established, along with input apparatus in the form of a keyboard, which may be employed to register the results of a communication. Of course, these structures may take a variety of different forms, as considered in greater detail below.

Considering an illustrative operation of the system somewhat generally, assume for example that an operator is situated at each of the stations S with the collective objective of contacting a lengthy list of debtors in an attempt to obtain individual payment commitments. With conventional telephone equipment, the operators could be expected to spend a substantial amount of their time attempting to contact individual debtors. For example, a time allotment of 50% might be anticipated merely for efforts to establish contact with the debtors. On the contrary, in the use of an embodiment of the present system, that time allotment could be a small percentage.

Pursuing the above example for the operation of the system of FIG. 1, the storage unit 14 registers a data cell or code word for each party (debtor) desired to be contacted. Specific formats of the code word are considered below; however, in general, the data may include: the telephohe number of the station where the party is expected to be contacted, identification information on the party, a status code for the contact represented by the code word, and a data space for registering the results of the call.

The code words from the storage 14 are transferred sequentially to the apparatus 10 for individual processing in one of the operating registers R. In that regard, the number of operating registers R may vary with respect to the number of operator stations S. In one embodiment, there is an excess of one operating register R. Thus, when each operator station S is busy with a called party (in association with an operating register R), the free operating register R seeks contact with a called party in anticipation of an operator concluding a contact. A premature contact may prompt a recorded message, requesting the answering party to wait an available operator. An alternative embodiment may involve a similar number of registers R and stations S. Functionally, to accommodate a time when one of the operating stations S becomes available to handle a call, depending upon implementation, a code word is transferred into an available register R to control the automatic dialer 12 (through the switching unit SW) seeking to establish telephonic communication with the station specified by a telephone number represented in the code word. In the event that the call results in either a "no answer" or a "busy" situation, the system proceeds to process another code word identifying a different party.

Upon establishing contact with a desired station, an available operator station S is operatively coupled to the proper register R (through the switching unit SW) and to the contact telephone line (through the dialer and line coupler 12). In that manner, the available operator station is coupled for communication with a remote station along with the particular operating register R containing the data cell for the remote station that has just been contacted. At one time, the operating register R1 may be associatively and functionally connected with the operator station SN and at another time the register R1 may function with the station S1.

Concurrently, with the establishment of telephonic contact and the functional association (coupling) of a station S and a register R, the operator at the involved station S is cued with a message to be given to the remote party. For example, assuming that the party desired to be contacted is a "Mr. Jones", the operator may be provided a display as indicated in FIG. 2. Thus, the operator is provided a physical presentation including the name of the person to be contacted along with a message incorporating fixed and variable information. Consequently, the operator can immediately enter into telephonic conversation, being completely cued for the call.

In the display as illustrated, variable information is indicated by underlines 18, 20 and 22 (not necessarily part of the display). Specifically, at line 18 the name of the party to be contacted is indicated. The amount of the debt is indicated above the line 22 and the period during which the debt has been overdue is indicated at the line 20.

Presented with an established communication channel to a remote party and a visual message cue (as illustrated in FIG. 2), the operator paraphrases or reads the cue, seeking to obtain a commitment for a payment of the amount within a specified number of days. If a commitment is obtained, the operator actuates an input apparatus at the operating station S, to register a predetermined number of dollars (indicated in the display above line 24) to be paid within a predetermined number of days (indicated above line 26).

Upon completion of a present effort, code words are transferred from the apparatus 10 to the storage unit 16, having been modified to reflect the effort to process, e.g. the experience in relation to the identified party. In addition to the specific possibilities as generally indicated above, various other data also may be obtained and registered. For example, an operator may learn that a telephone number has been changed or that contact with a party is most likely to be made at a specific time. In accordance herewith, such information may be registered in the code word for subsequent processing. That is, repeated processing efforts may be involved, with the contents (code words) of the storage 16 being returned to the storage 14 (either with or without interim processing) for another effort to seek additional contacts, thus advancing the total list toward completion.

In view of the above preliminary explanation of an embodiment of the present invention, some comments are deemed appropriate at this point. First, it now should be appreciated that the system might be operated to accommodate any of a variety of telephone control functions. That is, just as a television receiver is capable of receiving a wide variety of program information, a system in accordance with the present invention may be variously employed to implement different telephonic communications.

Fundamentally, the system involves apparatus for automatic control and telephone call sequencing. Storage apparatus is provided for registering code words

(telephone numbers, status of contacts, identification of contacts, calling time and so on) along with cuing information for use by an operator. The system further incorporates control apparatus for processing calls and resulting data in an organized manner and in accordance with the demand of the individual operators manning specific operating stations. Thus, the effectiveness of the operators is considerably enhanced as by reducing the volume of tedious labor.

Considering the system in somewhat greater depth, reference will now be made to FIG. 3, showing the system of FIG. 1 in detail. Although certain elements are depicted in both figures, in the interests of clarity, separate identification numerals are employed. As a related comment, in FIG. 3, elements of the system are either depicted as blocks or as logic components using a standard format. As another point of information, the system involves primarily binary control signals with data represented in an alphanumeric, binary-signal format. For convenient reference, a glossary of signals specifically identified in FIG. 3 is provided below, indicating the signals by name, character and source.

SIGNAL OR CODE	CHARACTER	SOURCE
AD	Automatically-registered data	Code word
BN	Indicates busy station in storage	Flip flop 101
BP	Breakpoint	Code word
BR	Busy station in storage	Storage 100
BRI	Code word in busy storage (RI)	Register RI
BRN	Code word in busy storage (RN)	Storage 100
BY	Called station busy	Telephone system 48
C	Clock signal	Control unit 42
DA	Called station does not answer (time lapse)	Telephone system 48
DC	Call terminated	Telephone instrument 56
GI	Code word moving into register R	Control unit 42
GO	Code word moving out of register R	Control unit 42
HI	Halt detected (code word in)	Detector 72
HO	Halt detected (code word out)	Detector 94
ID	Identification	Code word
MD	Manually-entered data	Code word
NI	Code word in transfer - RI	Control unit 42
NN	Code word in transfer - RN (NT1 + NT5)	Control unit 42
NT1	State 1 RN	Control unit 42
NT2	State 2 RN	Control unit 42
NT3	State 3 RN	Control unit 42
NT4	State 4 RN	Control unit 42
NT5	State 5 RN	Control unit 42
NT6	State 6 RN	Control unit 42
ON	Operator ready generic	Operating stations
ON1	Operator ready station 1	Station 1
ONN	Operator ready station N	Gate 93
PA	Called station answered	Telephone system 48
SA	Fresh code word	Code word
SB	No answer (station SN)	Telephone system
SC	New telephone number	Keyboard 58
SD	Calling time specified	Keyboard 58
SE	Busy sequence occurred	Busy storage 100
SF	Code word processed	Keyboard 58
SG	Wrong number	Keyboard 58
SH	No answer - Register RN	Keyboard 58
SQ	Busy signal Register RN	Source 107
SN	No answer at Register RN	Source 97
SI	Designates need to process word (see subsequent chart)	Decoder 74
ST	Start transfer	Gate 62
ST1	State 1 RI	Control unit 42
ST2	State 2 RI	Control unit 42
ST3	State 3 RI	Control unit 42
ST4	State 4 RI	Control unit 42
ST5	State 5 RI	Control unit 42
ST6	State 6 RI	Control unit 42
SX	Status of code word	Code word
TEL	Telephone number	Code word

In general, the flow path of signals representing the individual data cells or code words is from a source storage 30 (upper left) to a destination storage 32 (upper right) after dwelling temporarily in the storage of one of the operating registers RI through RN. The format for code words herein is uniform with individual elements of data being separated by break codes designated as signals BP. In the illustrative embodiment, the individual components of a code word (separated by breakpoint signals BP) are as follows:

DESIGNATION	DATA
HALT	Code designated for separating data code words
SX	Status of code word, e.g. unprocessed, completed, etc.
TEL	Telephone number of station to be called
ID	Identification for party to be contacted
MD	Manually entered data, e.g. code indicating the results of a call

-continued

DESIGNATION	DATA
AD	Automatically entered data, e.g. code indicating the time elements of a call

The code words are manifest in a binary, alphanumeric format. The "HALT" code is simply a unique designation which manifests the end or conclusion of a code word. The status code SX (general designation) may take any of a variety of specific forms and in that regard, the following forms with extensions are used in the system as disclosed herein.

STATUS CODE	DEFINITION
SA	Code word is unprocessed* (fresh data cell)
SB	No answer in response to call attempt from operating register R1*
SC	Number changed as indicated on an attempt from operator station S1*
SD	Code word flagged to indicate a specific calling time after an attempt from operator station S1*
SE	Busy signal received in response to attempt from register R1*
SF	Communication completed at operator station S1
SG	Wrong number obtained at operator station S1
SH	No answer in response to call attempt from operating register R2*
SI	Number changed as indicated on an attempt from operator station S2*
SJ	Code word flagged to indicate a specific calling time after an attempt from operator station S2*
SK	Busy signal received in response to attempt from operating register R2*
SL	Communication completed at operator station S2
SM	Wrong number obtained at operator station S2
SN	No answer in response to call attempt from operating register RN*
SO	Number changed as indicated on an attempt from operator station SN*
SP	Code word flagged to indicate a specific calling time after an attempt from operator station SN*
SQ	Busy signal received in response to attempt from operating register RN*
SR	Communication completed at operator station SN
ST	Wrong number obtained at operator station SN

*Indicates need for another attempt to establish communication with the remote party and will decode to provide a binary command signal S1 high.

As indicated, signals representing the code words or data cells are moved from the source storage 30 (FIG. 3) selectively into one of the operating registers R for processing. Of course, the number of such registers may vary in different systems. To indicate a variable number of registers R, a dashed line 35 extends between registers R1 and RN. The register RN is represented in detail and defined within dashed lines.

Movement of the signals representative of code words from the data source storage 30 is selectively directed into an available operating register R through a data source multiplexer 38. In a somewhat related manner, after processing, the signals manifesting the code words move from the operating registers R to the destination storage 32 through a destination multiplexer 40. The multiplexers 38 and 40 (along with other elements of the system) receive timing and control signals from a control unit 42 (left).

One of a set of signals N1-NN from the control unit 42 is exclusively high during each transfer interval to designate a single one of the registers R for communication through either the multiplexer 38 or the multiplexer 40 depending upon the state of operation. A simple inventory availability apparatus in the control unit 42 sequences the operation to load and unload code words appropriately into and out of the operating registers R by providing one of the signals N1-NN exclusively high to designate a specific register R. The signals N1-NN are provided high in precise coincidence with the timing signals defining loading and unloading periods for specific registers R.

The type of transfer (in or out of the operating register R) is indicated by the signals GO and GI which exclusively actuate one of the multiplexers 38 or 40. That is, for example, the high state of the signals NN and GI would command the multiplexer 38 to transfer a code word to the operating register RN. Alternatively, such a state for the signals NN and GO would set the multiplexer 40 to transfer a code word from the operating register RN to the storage 32.

Pursuing further consideration of the specific signals from the control unit 42, a set of timing signals are provided to indicate the status of each of the operating stations. These signals serve to define, among other things, the precise times for transfer. For example, the timing signals ST1, ST2, ST3, ST4, ST5 and ST6 indicate the state of the operating register R1 while a similar set of timing signals NT1, NT2, NT3, NT4, NT5 and NT6 manifest the state of the operating register RN. The provision of these timing signals along with other control signals may be variously accomplished in the control unit 42 in accordance with well-known logic implementation as disclosed in a book: "Computer Organization" by Ivan Flores, Prentice-Hall, Inc., 1969, specifically as in Chapter Two. The general logic is set out below along with functional explanations, reduced for ease of explanation to a single operating register R.

TIMING OPERATIONS	
LOGIC OPERATIONS	FUNCTIONAL OPERATION
T1 = T6·ON·BN + T3·BY·BN	Load fresh code word into operating register

-continued

TIMING OPERATIONS LOGIC OPERATIONS	FUNCTIONAL OPERATION
T2 = T1·HI	Check status of code word
T3 = T2·S1 + BN'·T6	Dial telephone
T4 = T3·PA	Oral communication period
T5 = T4·DC + T2 (delay + S1') + T3 (delay + DA) + T3 BY·BN' + T2·(SF + SL−) + T3 DA	Unload code word from operating register
T6 = T5·HO	Stand by for multiplexer access

EXPLANATIONS

T1 = from T6, providing an operator is ready (or anticipated to be ready) and no "busy" code word is registered in suspense; or from T3, providing a "busy" signal occurs and no "busy" code word is registered in suspense

T2 = from T1, providing code word is transferred into operating register

T3 = from T2, providing code word is to be processed; or from T6, providing a "busy" code word is held in suspense

T4 = from T3, providing telephonic (oral) communication is established

T5 = from T4, providing telephonic (oral) communication is terminated; or from T2 if the code word is not to be processed, or from either T2 or T3, providing an undue delay interval; or from T3, providing a "busy" signal results when a code word is already in the suspense (busy) register; or from T2, providing the code word has been processed

T6 = from T5, providing the code word is returned to storage

It is to be noted that in the above logic equations, the signals are indicated generically by dropping the station designation, e.g. T1 is generic for signals ST1 through NT1 (state one, each station). Other signals indicated in the logic are: ON, BN, BY, HI, S1, PA, DC and HO. Although described in detail below, introductory comments will now be made on such signals. Signal ON indicates that the attending operator and the operating station are ready to receive a contact. The signal BN manifests that a code word which produced a "busy" signal from the telephone system is being held in suspense for immediate attention after the code word in process. The signals BY and PA respectively indicate a "busy" signal and an "answered" call condition while DA indicates no answer from called station. A halt code (HALT) is indicated to have been detected (manifesting the end of a code word) by the binary signals HI and HO. A word having a status code which indicates the need for further processing effort is decoded to produce the signal S1 high. Finally, the signal DC indicates a call has been terminated.

A clock signal C is also provided from the control unit 42 as very well known in the prior digital processing art, for sequencing the operation of the system. As indicated above, the signals N1 through NN (one signal for each register R) are provided to designate a time when each of the operating registers R is currently in the process of either receiving or providing a code word. As a consequence, these signals are high during the intervals of transfer, i.e. T1 and T5. The input signals to the control unit are indicated, reflecting the above logic expressions. Although represented signals are from operating register RN and station SN, similar signals from other such stations would also be applied, as designated by dashed lines in the figure.

Returning now to further consideration of the operating registers R, each is connected through a switching unit 43 (center FIG. 3*a*) to an automatic dialing unit and line coupler 46, which is in turn connected to a telephone system 48. The switching unit 43 is controlled by the control unit 42 through a cable 49 to time share the automatic dialing unit 46 among the registers R and to selectively couple the registers R to the operating stations S for associated operation. The operating stations S are selectively coupled to telephone lines (represented by the system 48) for oral communication through the coupler 46.

The telephone system 48 as represented herein further includes a binary signal generator for manifesting the three signals indicative of calling responses. Essentially, the structure simply senses the conditions of: "busy", "don't answer", and "answered", to provide respectively the binary signals BY, DA and PA as described above.

Turning now to the detailed structure of the representative operating register RN, individual code words are received in a code-word register 50. From that location, the code words actuate control functions and are modified in accordance with the results of placing a telephone call. That is, initially the operating register RN operates directly with the telephone system (through the switching unit 43). During that period, a number is dialed, seeking contact with the desired party. If no contact occurs, e.g. "busy", or "no answer", the system records the fact, in the code word, and proceeds to pursue processing another code word. However, if contact occurs (T4), then the register R is functionally coupled to an available operating station S and the code word is subsequently modified to reflect the consequences of the contact. Such modification involves input action by the operator at the operating station S.

As indicated above, each operating station S incorporates display facilities for manifesting a cue. Specifically in the station SN, a display unit 52 is provided which incorporates a storage section 54. Of course, the storage section 54 may be common rather than station associated. Also, the station SN is equipped with a telephone instrument 56 (lower left) which as indicated above may comprise a head set with an attached microphone or mouthpiece. The operating station SN also incorporates a keyboard 58 (lower left) which is employed to register data (perceived by the operator) in code words. That is, during a conversation, the operator may formulate a status code to modify the code word so as to indicate the results of a contact. For example, the operator may register completion of the desired inquiry.

In view of the above preliminary description of the system represented in FIG. 3, a complete understanding may now best be accomplished by considering specific operating cycles. Accordingly, assume that the operator station SN is attended and ready to become operational. Furthermore, assume that the source storage 30 contains a multiplicity of data words identifying parties who are to be contacted, for example, in relation to a debtor's account as explained above. Finally, assume that the operating register RN is available (free) and is next in the operating sequence to establish communication, as for an operator located at an operating station S. The operation may proceed from such

a point with the control unit 42 providing a high state for the signals: NN, GI, and NT1. Recapitulating, the signal GI designates an interval of transferring data into an operating register R; the signal NT1 indicates an interval of loading a code word into the register RN and the signal NN is coincident and commands the multiplexer for such a transfer. The application of the starting signal GI to the source storage 30, provides a code word through a channel 66 and the multiplexer 38 (directed by signal NN) to the register 50 in operating register RN.

In the structural form of the system as described herein, signals representative of the code word are simply stepped into the register 50 element-by-element under the control of clock signals C which are applied to the register 50 through an "AND" gate 68 (upper left). In that regard, the "AND" gate 68 is qualified by the signal NN, designating register RN to be in a transfer state. Thus, a code word is moved from the source storage 30 into the register 50.

The end of a code word is sensed when a halt detector 72 (upper left below storage 30) senses the HALT code. The detector 72 may take any of a variety of forms of binary-code detectors and functions to provide the high state of the binary signal HI, upon sensing the HALT code, to manifest the end of the code word. The signal HI is applied directly to stop the output operation of the source storage 30 pending another cycle of operation. The signal HI is also supplied to the control unit 42 to terminate the timing interval indicated by the signals NT1 and NN, as well as to initiate the interval of the timing signal NT2 in accordance with the logic as set out above.

During the interval of timing signal NT2, the status of the inquiry represented by the registered code word is considered. Exemplary of the status data which may be represented by a code word now contained in the register 50 is the following:

HALT	Code
SX	Manifests that the code word is fresh (unprocessed)
TEL	6271292
ID	John Jones, Los Angeles
MD	(blank)
AD	(blank)

With reference to the portions of the code word designated as MD and AD, a fresh or unprocessed code word normally would carry no data relating to prior efforts at processing. Such data is indicative of experiences during prior efforts to process and is useful in processing the contents of the destination storage 32 to analyze or study: performance of operators, results of processing and status of processing. During efforts to process a code word, if a party is contacted, the section MD will receive an input from the operator to designate any of a variety of call results, e.g. payment promised on a certain date, telephone number changed, or so on. Conversely, the section of the code word designated as AD automatically receives data (independently of an operator while the code word is in an operating register R), e.g. the time of contact and the time of termination. The actual registration of information in both the sections MD and AD is explained in detail below.

Recapitulating, at the presently-described stage of operation, a code word indicative of a particular party

or subject to be contacted is contained in the register 50. Additionally, the control unit 42 has just provided the timing signal NT2 in a high state. As a consequence, a status decoder 74 (left, below register 50) is actuated to sense the status portion SX of the code word to provide a representative binary signal S1. That is, assuming the code word is fresh (or if otherwise in need of processing), the decoder 74 indicates a high value for a signal S1 (S1 = SA + SB + SC + SD + SH + SI + SJ + SK + SL - - -) which is applied to the control unit 42 as well as to a gang (parallel transfer) gate 78. The qualification of the "AND" gate 78 by the signal S1 results in the transfer of the telephone number signals (TEL) through that gate 78 and the switching unit 43 to the dialing unit 46 through a cable 79. Somewhat concurrently, the timing sequencer in the control unit 42 is advanced to provide the signal NT3 in a high state, such occurring with the coincidence of the signals NT2 and S1 as indicated in the above logic expressions.

Subsequently, the automatic dialing unit 46 is actuated as a result of the occurrence of the third-phase timing signal (T3) from the control unit 42, e.g. NT3. In the disclosed embodiment, the unit 46 (with a single dialer) is shared among the operating registers R. In the assumed example, during the period indicated by the signal NT3, the number: 6271292 is dialed by the dialing unit 46, providing appropriate input signals to the telephone system 48.

Upon completion of the dialing operation, any of a number of events may occur. For example, a "busy" signal BY may be indicated from the telephone system 48 or the remote station dialed may or may not be answered, resulting in the signal DA. Only when the remote station is "answered" (producing the signal PA high) is the operating register RN coupled to the operator station SN. Thus, the operating registers R receive data cells or code words and process such words to the point of contacting a person at a remote station before becoming functionally coupled to an available operator station S. Summarizing, code words are transferred to individual operating registers R from which telephone numbers are provided in time-shared sequence to the dialing unit 46. Only when the remote station dialed is answered, is the operating register R functionally coupled to an available operator station S (through the switching unit 43) and the operating station S to the telephone system 48 (through the coupler 46).

Structurally, the switching unit 43 is simply a signal-controlled switching apparatus as well known in the art. Control signals are provided from the primary control unit 42 through the cable 49. The unit 43 multiplexes the operating registers R which are in the state designated T3 for time-shared access to the telephone dialing unit 46. Thus, one aspect of the switching unit 43 is structurally simply that of a multiplexer. The other function of the unit 43 is to intercouple individual operating registers R to individual operator stations S which are in turn connected to the telephone system 48. Specifically, under the control of the primary control unit 42, the switching unit 43 interconnects a series of inputs, collectively designated as cables 51 and 53 to a select one of the operating stations S, when the remote station sought for an operating register R is contacted and an operating station S is available. Thus, connection is established from a specific operating register R to a specific operator station S through: one of the cables 51, the unit 43 and one of a series of cables 53.

Such a connection, along with the connection of the operating station S to the telephone system 48 endures only for the period of the timing signal T4 for the specific operating register R involved in the connection.

Summarizing the operation to some degree, the unit 43 time shares the automatic dialing unit 46 among the operating registers R that are in the state designated by the signal T3. Furthermore, the same switching unit 43 functionally couples operating registers R to operator stations S during the intervals that such registers R are designated by the timing signal and concurrently connection is established between the operator station S that is involved and the telephone system 48, as disclosed in detail below.

In one embodiment of the present system, the multiplexing of the operating registers R to the dialing unit 46 is further qualified in relation to the availability of certain telephone lines. That is, in the disclosed embodiment, the application involves telephone numbers specifying stations that are compatible to all the telephone lines represented to the automatic dialing unit 46 by the telephone system 48. However, it is envisioned that with the exercise of ordinary skill in the art, in view hereof, line selectivity could be provided on the basis of telephone numbers. That is, the multiplexing operation of the switching unit 43 would relate specific telephone numbers to specific telephone lines and access the registers R accordingly. Of course such accessing could also be related to selectively couple certain operator stations S to specific of the operating registers R on the basis of telephone numbers or other criteria.

Returning to the system of the disclosed embodiment, as indicated above, with the occurrence of the timing signal T4, indicating a remote station has been answered, an available operator station is coupled to the operating register R and the telephone system 48, by the switching unit 43. Also, upon the occurrence of the signal PA (remote telephone station "answered") during the timing signal NT3, the available operator station S is coupled to the contact telephone line, through coupler 46, and the control unit 42 advances the operating sequence to NT4, i.e. the signal NT4 becomes high.

Considering the connections somewhat more specifically, cable 51 from the operating register RN is connected through the switching unit 43 and one of the cables 53 to the free operator station SN. Concurrently, the free station SN is connected through the line coupler 46 to the telephone system. In that regard, the coupler 46 is simply controlled by a signal received from the control unit 42 through a cable 83, to couple the line that has been "answered" to a free operating station, specifically SN for example, at the instant of timing signal T4. The coupling is broken at the time of the signal T5 when the conversation is terminated.

To accomplish the cuing display for an operator simultaneously with the line coupling, the signal NT4 is applied to an "AND" gate 80 which passes signals representing a selected portion of the identification data ID through the switching unit 43 for display by the display unit 52. Of course, the specific display employed may be varied in accordance with a desired format. However, as disclosed herein, the identification information is presented in an integrated cuing message along with fixed information provided from the storage 54. Specifically, as illustrated in FIG. 2, the operator sees a complete cue with the identification information from the register 50 providing the name of the party to be contacted and details of the dept which forms the subject of inquiry. Thus, when the system enters the period manifest by the high state of the signal NT4, the operator is provided complete cue information with which to proceed.

Continuing with the assumed example, during the initial portion of the interval manifest by the signal NT4, the operator reads (or paraphrases) the message or cue provided by the display unit 52 (FIG. 2). Thus, the operator seeks to obtain a commitment for the payment of a specified amount of money prior to a specified time. In that regard, assume for example, that during the conversation the operator is given a commitment by the called party, for the payment of $100.00 within 10 days. In such a situation, the operator employs the keyboard 58 to provide a code signal indicative of that commitment for registration in the signal portion MD (manual data) of the register 50. Of course, various formats may be employed to encode different commitments or agreements; however, an exemplary format is indicated by the alphabetic pattern as follows:

CODE	REPRESENTATION
A	$10.00 within ten days
B	$20.00 within ten days
C	$30.00 within ten days
D	$40.00 within ten days
—	—
—	—

In accordance with an extension of the above exemplary format in the described situation, the operator would actuate the keyboard 58 to indicate the commitment as code J and also would revise the status of the code word to SR (processed at station SN). Thus, the code word would carry an indication that is was processed at the station SN and that the party had committed to make a payment of $100.00 within a period of 10 days.

It is noteworthy that the keyboard 58 is operatively controlled for use by the signal NT4 to enable an input to the code word. In that regard, the operator may provide other code indications, as considered above, including a subsequent time to contact the party or a different telephone number for the contact. In the latter event, the keyboard 58 is actuated to place a fresh telephone number in the register 50, section TEL . Specifically, a cable 53, coupling the keyboard 58 to the register 50 through the unit 43, carries signals which establish a fresh telephone number in the appropriate section (TEL) of the register 50.

Additionally, the station operator may actuate the keyboard to provide other status codes, e.g. signal SO, "number changed". In an alternate form, the system may be embodied to pursue the fresh number immediately by the addition of structure somewhat as described below in association with the processing of a "busy" number. However, as described herein (for simplication), the code word containing a fresh number is simply returned to the destination storage 32 for subsequent processing during a later cycle into an operating register R.

In addition to the data provided to the register 50 from the keyboard 58 (under manual control), the system also automatically records certain significant data. Specifically, the identification of the operator is

contained in a register 88 (operator station SN) which is connected through the cable 53, the switching unit 43 and a gang "AND" gate 90 to the portion AD of the register 50. The "AND" gate 90 is qualified by the signal NT4 to pass signals identifying the operator to the register 50.

Certain reference times relating to contact are also registered, some of which occur prior to contact. Specifically, the portion AD of the code word (in the register 50) provides space for three distinct real-time entries when a word is processed. The time of attempted contact (NT1) is registered, the time of established contact (NT4) is registered, and the time of terminating an established contact (NT5) is registered. The signals (NT1, NT4 and NT5) indicative of these times are applied to an "OR" gate 91 which qualifies an "AND" gate 92 connected between the portion AD of the register 50 and a real-time clock 94 which provides digital representations of the real time, as in a Julian format. The time signals are thus stored.

At the conclusion of a telephonic contact, significant information has been registered (manually and automatically) in the code word. As in the above example, the code word may have been completely processed, as with a payment commitment. Alternatively, the word may represent a contact yet to be established, as considered in detail below. In any event, after the effort to process, the code word is transferred to the destination storage 32 upon initiation of the signal NT5.

In concluding a telephonic contact, the operator actuates the telephone instrument 56 to provide a disconnect signal DC which is applied to the control unit 42, and to an "AND" gate 93. The control unit 42 then advances the indicated state for the operating register RN from that of the signal NT4 to NT5. The "AND" gate 93 receives another input from a switch 95. So long as the operating station SN is attended, the switch 95 is closed. Accordingly, with the switch 95 closed and the telephone instrument disconnected, the "AND" gate 93 is qualified and provides the signal ON high to indicate readiness for another contact, the switching unit 43 isolating the station.

Upon the occurrence of the signal NT5 for the operating register RN, the control unit 42 provides the signal GO (high state) and the high state of the signal NN. These signals command the transfer of the code-word signals from the register 50 through the destination multiplexer 40 to the destination storage 32. In the single-multiplexer embodiment, as the multiplexer 40 is common to all of the operating registers R, the signals T5 are exclusively high among the operating registers which may involve some delay in the existence of the signal NN to command transfer of the code word to the destination storage 32.

Movement of the code-word signals from the register 50 again is accomplished in a stepping fashion by the clock pulses C which again are applied through the "AND" gate 68. In that regard as indicated above, the gate 68 is qualified during the transfer period by the signal NN. At the end of the transfer, as the HALT code moves from the register 50 through the multiplexer 40, that code is sensed by a HALT detector 94 to provide the high state of a binary signal HO. At such time, the transfer to the storage 32 terminates and the control unit provides the signal NT6 in a high state. That signal commands the "stand-by" configuration during which an operating station SN awaits the time-shared operation of the multiplexer 38 to receive the next code word.

Thus, individual code words are drawn from the source storage 30, distributed selectively to operating registers R1 through RN to specify a remote station to which contact is desired for communication with a specific party. The code words carry the signals to control automatic dialing equipment in an effort to establish communication. As indicated above, in the event that contact is made, the operator is connected for communication and cued with pertinent information from which a response is solicited. The response may then be registered as a portion of the code word completing the desired communication. Therefore, it will be apparent that the operators are released from the burdensome and time-comsuming work of seeking to establish contact and additionally, the effectiveness of the operator is substantially improved by the cuing displays. The utilization of state-of-the-art operating components in the system enables very high-speed operation with the result that several code words may be tested with little or no concern for time loss by individual operators. Of course, as will be readily apparent to one skilled in the art, various numbers of automatic dialers and various forms of multiplexing equipment may be employed to accommodate a desired number of operators at individual operating stations.

The above explanation of an operating sequence proceeded on the assumption that telephonic communication was established with a party. However, as indicated, other possibilities may exist, i.e. the remote telephone station may not be answered or may be busy. In the event that the call is unanswered, the system proceeds on the premise that another attempt should be made at a considerably later time. However, the event is recorded in the code word by the qualification of an "AND" gate 95 (right, below register 50). That is, upon the occurrence of the signal DA (indicating no answer) during the interval NT3, the gate 95 passes an appropriate code, i.e. code SN (chart above) from the code source 97 to be registered in the SX section of the code word in the register 50. Concurrently, the state for the operating register RN changes from that of signal NT3 to that of signal NT5. As a result, the system proceeds to unload the code word signals from the register 50 to the destination storage 32 as explained above. The word thus being held for another subsequent effort to process.

The manifestation of a busy remote station, on the other hand, suggests that the telephone is being attended with the result that one more effort should be made within a relatively short period, e.g. a few minutes. Accordingly, the system places the instant code word in a temporary storage location, proceeds to process another code word from the source storage 30, then subsequently retrieves the code word which prompted a busy signal and repeats the effort to establish communication.

It will be apparent to one skilled in the art that various embodiments hereof may utilize different types of storage to accommodate a series of "busy" responses and to circulate signals representative of code words for repeated dialing operations as to some preselected number of attempts. However, as disclosed herein, the illustrative embodiment simply registers the code-word signals with an indication of a busy, proceeds with another code word, then returns for one more attempt

with the code word carrying a number indicated to be busy. Failing contact at that time, the code word is flagged and the representative signals are returned to the destination register 32.

It is during the interval which is represented by the signal NT3 (after dialing) that the "busy" tone may result to produce the signal BY from the telephone system 48. Upon such an occurrence (providing no prior busy code is registered), a gang "AND" gate 98 (center, below register 50) is qualified to transfer the entire contents (code word) from the register 50 to a busy-signal storage 100. The "AND" gate 98 is connected between cables 99 and 102 to accomplish a parallel transfer to a busy-signal storage 100.

With the registration of the "busy" code-word in the storage 100, the signals BY and NT3 actuate the control unit 42 to provide the signal NT1 in a high state, as indicated in the above logic expressions. As a result, the signals BR and NT1 qualify an "AND" gate 103 to reset the flip flop 101 providing the signal BN' high until the flip flop 101 is set by the signal NT6.

During the period of the signal BN', a fresh code word is transferred to the register 50 for processing, then returned to storage (even if a busy signal occurs) in the destination storage 32. However, note that the code word involved in such a circumstance is flagged as a result of a gate 105 (under register 50) being qualified (coincident of signals BN' and NT3) to register the event in the code section SX. SL; . . .)

The signals from the storage 100, representing the previously "busy" code word are returned to the register 50 (gate 104 — signals BN and NT2) for another attempt at processing. Processing of the code word then proceeds as described above. If another busy signal is produced, with the signal BN high (flip flop 101 set), the control unit 42 commands transfer to storage 32 of the code word by providing the state indicated by NT5, again as specified in the logic expressions. Coincidentally, the busy experience is registered by qualification of an "AND" gate 105 by signals NT3 and BN' to pass the busy code SQ from a code signal source 107 to the status code section of the register SX. It is noteworthy that the same treatment occurs for code words that produce a busy signal BY at a time when a code word is being held for another attempt in the register 100.

After the transfer of all code words from the source storage 30 to the destination storage 32, some return may be made to the source storage 30 as indicated by a dashed line 110. For example, in the event that the code words are registered on a magnetic disc, the destination storage 32 may simply become the source storage 32. In such an event, as code words are moved into storage registers as the register 50, those code words which are indicated to have been processed by appropriate status code (SF, SL, . . .) are simply immediately transferred to the destination storage 32. That is, as indicated in the above logic equations, the occurrence of a processed status code, during the timing interval T2, immediately returns the system to a T5 configuration.

As an alternative to a direct transfer from the destination storage 32 to the source storage 30, some processing may be performed. In that regard, it may be advisable to eliminate processed code words, or to schedule code words for processing at specific times in accordance with an indicated time of availability for a party. Such operations may be performed in accordance with well-known data processing techniques and accordingly are not described in further detail herein.

In view of the above description, it may be seen that the system may be effectively used to schedule telephone contacts for various numbers of operators. Of course, the system may be variously implemented and variously used depending upon specific applications. Accordingly, the scope hereof shall not be referenced to the disclosed embodiment, but on the contrary, shall be determined in accordance with the claims as set forth below.

What is claimed is:

1. A telephone scheduling system for use in cooperation with a telephone network, comprising:
   - storage means for storing a plurality of data cells including data on individual telephone numbers identifying stations to be contacted along with representations of message information;
   - at least one operating station including a telephone instrument, cue manifesting means, register means for receiving signals from said storage means representative of said data cells, and means for supplying data cell signals representative of message information from said register means to said cue manifesting means;
   - an automatic dialing means coupled to said telephone network and connected to receive data cell signals representative of telephone numbers from said operating station register means, for dialing said stations to be contacted;
   - sensing means coupled to said telephone network for providing an answer signal to indicate contact with one of said stations to be contacted and an interrupt signal to indicate termination of telephonic contact; and
   - sequence control means for sequentially providing signals representative of said data cells from said storage means to said operating station register means, returning said data cells to said storage means, and actuating said automatic dialing means, said telephonic instrument, and said cue manifesting means, under control of said sensing means.

2. A telephone scheduling system in accordance with claim 1 further including automatic input means for registering data in said register means of said operating station indicative of results from said sensing means.

3. A telephone scheduling system in accordance with claim 1 further including manual input means for registering data in said register means of said operating station indicative of data communicated to an operator at said operating station.

4. A telephone scheduling system in accordance with claim 1 including a plurality of said operating stations and further including telephone multiplexer means for selectively coupling said operating stations to said automatic dialing means and said telephone network under control of said sequence control means.

5. A telephone scheduling system according to claim 4 further including automatic input means for registering data in said register means indicative of results from actuating said automatic dialing unit.

6. A telephone scheduling system according to claim 4 further including manual input means for registering data in said register means indicative of data communicated to an operator at said operating station.

7. A telephone scheduling system according to claim 4 further including input means for altering said data cells in said operating stations to indicate call results.

8. A telephone system according to claim 7 including means to alter said data cells to indicate times of calls.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 3,989,899
DATED : November 2, 1976
INVENTOR(S) : Daniel Norwich

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column	Line	
14	1	"dept" should be --debt--;
14	49	after "TEL", --#-- should be inserted; and
17	29	after "SX.", "SL;...)" should be deleted.

Signed and Sealed this
Fifteenth Day of March 1977

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks

REEXAMINATION CERTIFICATE (796th)

United States Patent [19] [11] **B1 3,989,899**

Norwich [45] **Certificate Issued Dec. 15, 1987**

[54] **TELEPHONE SCHEDULING SYSTEM**

[75] **Inventor:** Daniel Norwich, Beverly Hills, Calif.

[73] **Assignee:** Telecredit Inc., Los Angeles, Calif.

Reexamination Request:
No. 90/001,163, Feb. 4, 1987

Reexamination Certificate for:

Patent No.:	3,989,899
Issued:	Nov. 2, 1976
Appl. No.:	566,643
Filed:	Apr. 8, 1975

Certificate of Correction issued Mar. 15, 1977.

[51] **Int. Cl.**[4] H04M 11/00; H04M 1/26
[52] **U.S. Cl.** 379/134; 379/92; 379/355; 379/201
[58] **Field of Search** 379/355, 134, 92, 265–267, 379/309, 356, 357, 359

[56] **References Cited**

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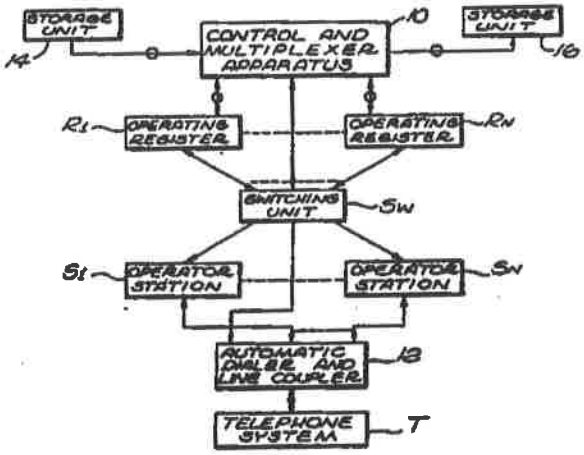
Primary Examiner—James L. Dwyer

[57] **ABSTRACT**

A system is disclosed for use in cooperation with a telephone network to schedule and control telephonic contacts, as from a plurality of calling stations to a number of parties at individual remote stations. Storage means are provided for registering code words (associated with stations that are to be called) along with representations of message information to be conveyed. For example, code words may store representations of: a number for a station to be called, the name of a party to be contacted at the station, a status code and so on.

In the operation of the system, a control unit actuates an automatic dialing unit with a number from storage. Subsequently, the system senses the possible results of dialing a number, i.e. as a busy signal, no answer or a station contact. In the event of a busy signal or no answer, a code word (from storage) may be appropriately modified then stored for use in a subsequent attempt. Upon the occurrence of a contact, connection is made to an operator station and a display unit is actuated to cue the operator with the desired message. The system also incorporates input means for use by the operator to enter information in the code word indicating the results of a call.



REEXAMINATION CERTIFICATE ISSUED UNDER 35 U.S.C. 307

NO AMENDMENTS HAVE BEEN MADE TO THE PATENT

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

The patentability of claims 1-8 is confirmed.

* * * * *

UNITED STATES PATENT

4,599,493

United States Patent [19]

Cave

[11] **Patent Number: 4,599,493**

[45] **Date of Patent: Jul. 8, 1986**

[54] **MULTI-LINE TELEPHONE CONTROL SYSTEM**

[75] Inventor: **Ellis K. Cave, Garland, Tex.**

[73] Assignee: **TBS International, Inc., Richardson, Tex.**

[21] Appl. No.: **644,971**

[22] Filed: **Aug. 28, 1984**

[51] Int. Cl.[4] **H04M 3/46**

[52] U.S. Cl. ..... **179/18 FH; 179/18 BA**

[58] Field of Search ..... 179/18 B, 18 FH, 6.02, 179/6.17, 18 BA, 90 BD, 90 B, 2 DP

[56] **References Cited**

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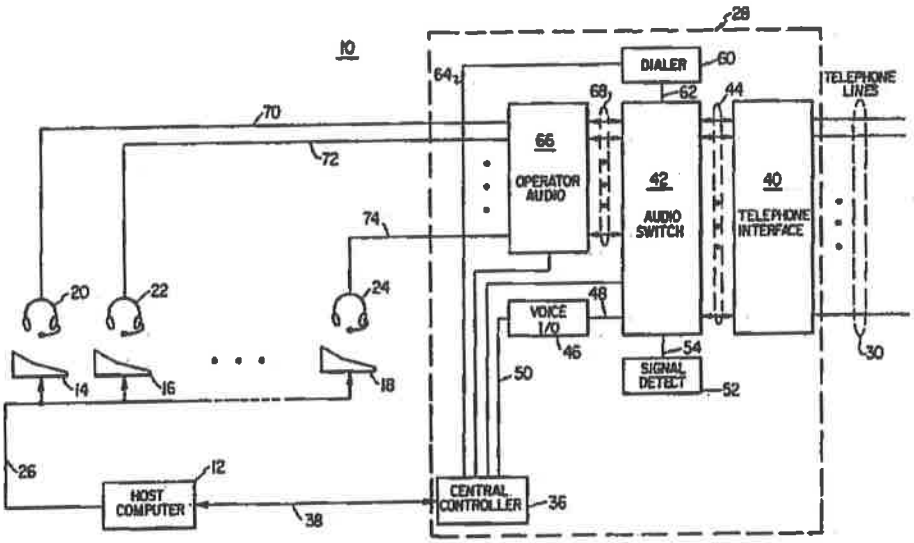
Primary Examiner—Thomas W. Brown

Attorney, Agent, or Firm—Richards, Harris, Medlock & Andrews

[57] **ABSTRACT**

An automated telephone calling system receives a group of telephone numbers from a host computer. For each telephone number there is a corresponding record of unique information. The host computer is connected to drive a plurality of operator display terminals. Each number is automatically called and equipment provides detection of rings, busy signals, recordings and voice answers. When a party answers a call, the called line is connected to a non-busy one of a group of operations. At the same time a report is sent from a central controller to the host computer reporting which number has been successfully called and which operator has been selected for the audio connection. The host computer then calls up the record for the called number and transmits at least a portion of the record to the display for the selected operator. The operator is thus provided with an audio connection to the called party as well as a screen display of relevant information for that party. When all the operators are busy the called parties are placed on hold until an operator is free. The operators are thus provided with a continuous sequence of answered calls for optimum utilization of the operators's time.

6 Claims, 2 Drawing Figures



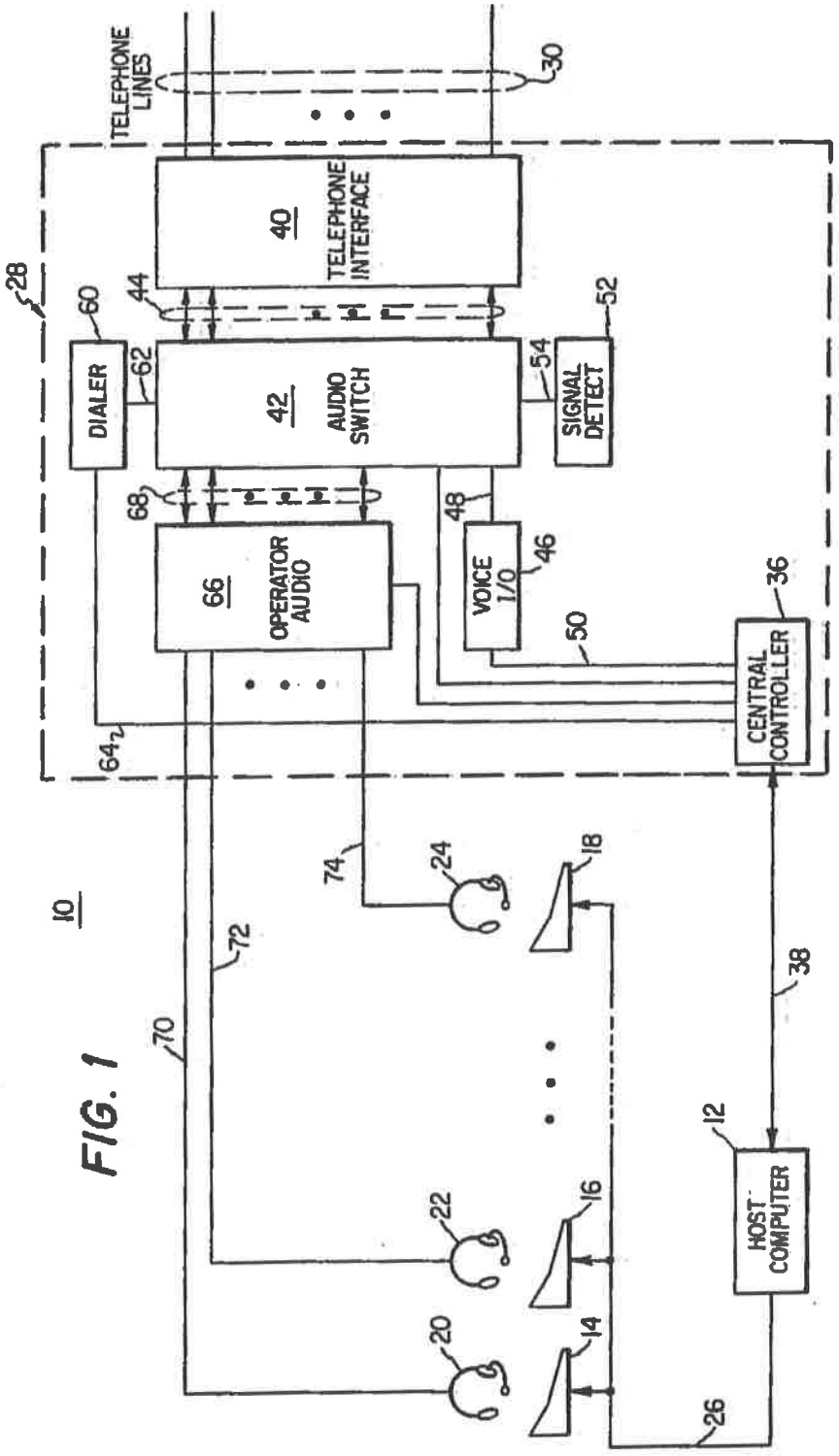
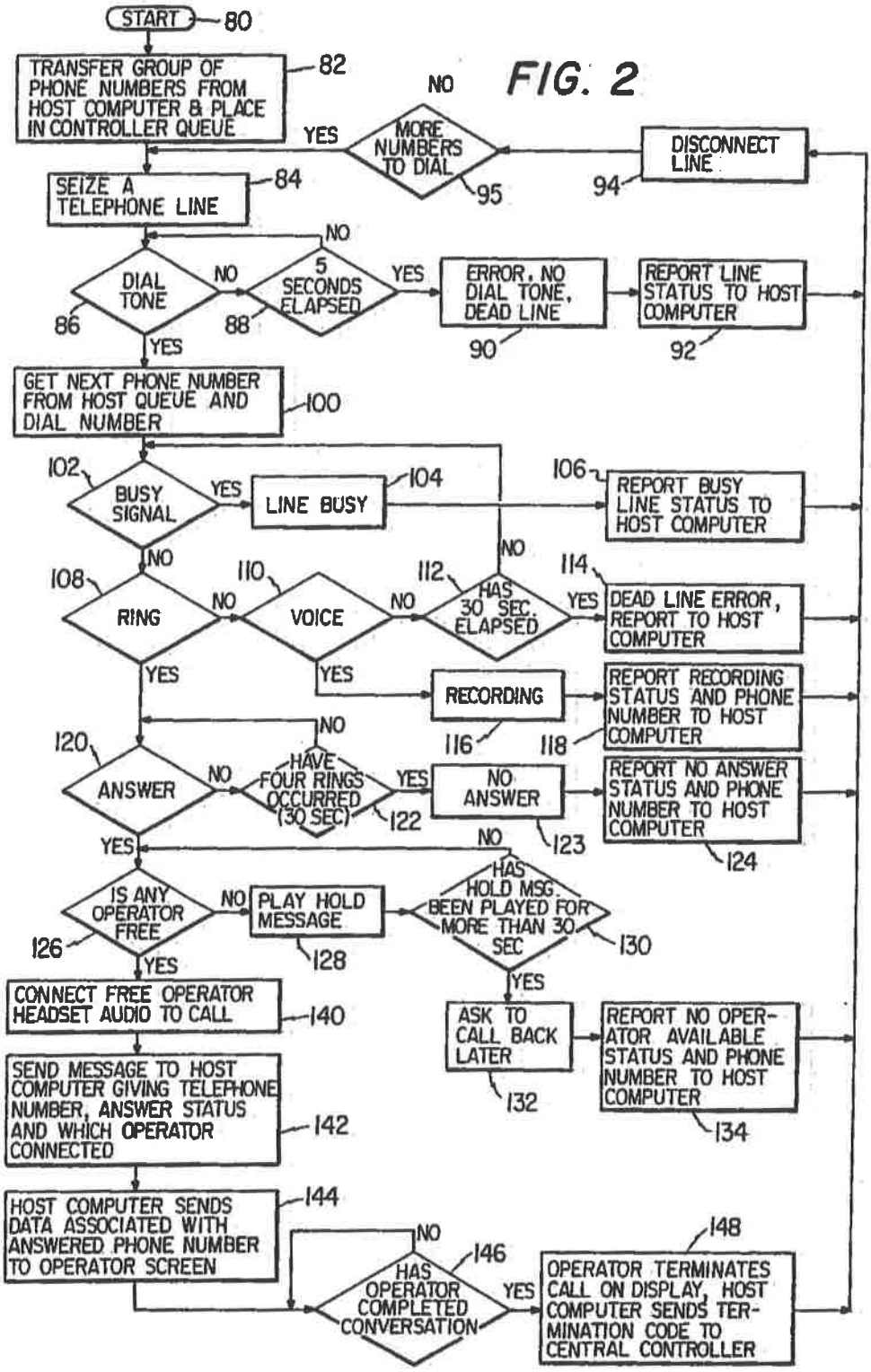

TELEPHONE LINES
30
40
TELEPHONE INTERFACE
28
60
44
52
DIALER
62
42
AUDIO SWITCH
54
SIGNAL DETECT
68
48
66
OPERATOR AUDIO
VOICE I/O
46
36
50
CENTRAL CONTROLLER
64
10
74
24
18
72
38
70
12
HOST COMPUTER
22
16
20
14
26

FIG. 1

FIG. 2


START
80
TRANSFER GROUP OF PHONE NUMBERS FROM HOST COMPUTER & PLACE IN CONTROLLER QUEUE
82
MORE NUMBERS TO DIAL
95
NO
YES
DISCONNECT LINE
94
SEIZE A TELEPHONE LINE
84
DIAL TONE
86
NO
5 SECONDS ELAPSED
88
YES
ERROR, NO DIAL TONE, DEAD LINE
90
REPORT LINE STATUS TO HOST COMPUTER
92
GET NEXT PHONE NUMBER FROM HOST QUEUE AND DIAL NUMBER
100
BUSY SIGNAL
102
LINE BUSY
104
REPORT BUSY LINE STATUS TO HOST COMPUTER
106
RING
108
VOICE
110
HAS 30 SEC. ELAPSED
112
DEAD LINE ERROR, REPORT TO HOST COMPUTER
114
RECORDING
116
REPORT RECORDING STATUS AND PHONE NUMBER TO HOST COMPUTER
118
ANSWER
120
HAVE FOUR RINGS OCCURRED (30 SEC)
122
NO ANSWER
123
REPORT NO ANSWER STATUS AND PHONE NUMBER TO HOST COMPUTER
124
IS ANY OPERATOR FREE
126
PLAY HOLD MESSAGE
128
HAS HOLD MSG. BEEN PLAYED FOR MORE THAN 30 SEC
130
ASK TO CALL BACK LATER
132
REPORT NO OPERATOR AVAILABLE STATUS AND PHONE NUMBER TO HOST COMPUTER
134
CONNECT FREE OPERATOR HEADSET AUDIO TO CALL
140
SEND MESSAGE TO HOST COMPUTER GIVING TELEPHONE NUMBER, ANSWER STATUS AND WHICH OPERATOR CONNECTED
142
HOST COMPUTER SENDS DATA ASSOCIATED WITH ANSWERED PHONE NUMBER TO OPERATOR SCREEN
144
HAS OPERATOR COMPLETED CONVERSATION
146
OPERATOR TERMINATES CALL ON DISPLAY, HOST COMPUTER SENDS TERMINATION CODE TO CENTRAL CONTROLLER
148

MULTI-LINE TELEPHONE CONTROL SYSTEM

TECHNICAL FIELD

The present invention pertains in general to telephone and computer technology and in particular to the automated dialing of a large group of telephone numbers for operator communication.

BACKGROUND OF THE INVENTION

Many types of businesses, political and charitable activities require extensive telephone contact with a very large number of people. It is been found that an individual operator working to place calls with a coventional telephone can make successful contacts only at a relatively slow rate. For a substantial percentage of the calls that are placed the phones are either busy or there is no answer. Thus, a large part of the operator's time is spent on nonproductive work. A number of devices have been developed to aid an operator or to automate the calling process. Such devices are shown, for example, in U.S. Pat. Nos. 4,001,508, 3,999,017, 3,445,601, 3,274,346, 3,943,289, 4,160,125, 4,201,896, 4,438,296, 3,072,746, 3,989,899 and 3,407,269.

These pre-existing devices typically provide automatic dialing of a predetermined group of numbers. However, this still leaves a substantial workload for the operator in addition to the truly productive time which is the actual conversation with the called party. When particular information is required in regard to the called party, such as in debt collection services, the operator must have a substantial amount of information concerning the party. The storage and physical handling of a large bulk of such information is wasteful of operator productivity.

In view of the requirements for large volume dialing with operator contact and maximum operator utilization, there is a need for a method and apparatus to provide operators with fully connected calls together with the required file information for a called party in such a rapid and flexible manner that a large number of operators can be kept busy at the most productive tasks in telephone calls.

BRIEF SUMMARY OF THE INVENTION

A selected embodiment of the present invention comprises a method for providing a continuous sequence of telephone calls to a plurality of operators, each having a display terminal and a bidirectional audio communications device. A plurality of records are stored in a host computer which drives the display terminals. Each of the records includes a telephone number and other relevant information for a called party. A first step comprises transferring a plurality of stored telephone messages from the host computer to a controller. Each of the telephone numbers is dialed in sequence on an available one of a plurality of telephone lines in response to the controller. The number of telephone lines is typically greater than the number of operators. After the dialing of each number, a line condition is detected for other than a busy or ring to indicate an answer. For each answer the telephone line is connected to the communications device for a non-busy one of the operators. Further for each answer a status message containing the answered number and the operator connected is sent to the host computer. In response to the transferred identification of the answered number and the one operator, there is transmitted by the host computer at least a part

of the stored record, which corresponds to the answered telephone number, to a display device for the one operator. Information from the record is displayed to the one operator concurrent with the one operator having audio communication through the answered line. The one operator is designated as busy until completion of the telephone call on the answered line. The described process is repeated until all of the operators are busy and then answered calls are placed on hold.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention and the advantages thereof, reference is now made to the following description taken in conjunction with the accompanying drawings in which:

FIG. 1 is a block diagram illustrating equipment for use in operation of a multi-line telephone control system in accordance with the present invention, and

FIG. 2 is a functional flow diagram describing the call placement procedure and operations for the system illustrated in FIG. 1.

DETAILED DESCRIPTION OF THE INVENTION

The apparatus for carrying out the present invention is now described in reference to FIG. 1. A multiple operator telephone calling system 10 includes a host computer 12, a plurality of operator display terminals 14, 16 and 18 having respective headsets 20, 22 and 24. The headsets provide bidirectional audio communication. The computer 12 communicates with the display terminals 14, 16 and 18 through a communication line 26. The system 10 further includes a multi-line telephone control system 28 which is connected to a plurality of telephone lines 30.

The control system 28 includes a central controller 36 which is connected through a bidirectional communication line 38 to the host computer 12. A telephone interface 40 is connected to the telephone lines 30. An audio switch 42 is connected to a plurality of bidirectional audio lines 44 to the telephone interface 40. A voice I/O 46 is connected through a line 48 to the audio switch 42 and through a line 50 to the central controller 36. A signal detect circuit 52 is connected through a line 54 to the audio switch 42. A dialer 60 is connected through a line 62 to the audio switch 42 and through a line 64 to the central controller 36. An operator audio 66 is connected through a group of bidirectional audio lines 68 to the audio switch 42 and through lines 70, 72 and 74 respectively to the headsets 20, 22 and 24.

The host computer 12 is, for example, a Wang VS100, the terminals 14, 16 and 18 are each VISUAL 50 ASCII terminals manufactured by Visual Technology, Inc., and the headsets 20, 22 and 24 are model ACS 10030 type headsets manufactured by ACS Communications Co.

The control system 28 includes the controller 36 which can be a Compupro 68000 computer, the signal detect circuit 52 is a TBS, International disconnect detect circuit as shown in U.S. Pat. No. 4,156,799 and TBS international call progress detect circuit as shown in U.S. Pat. No. 4,405,833 and the voice I/O 46 is a VOTAN Inc. VMS voice management system. The units comprising the telephone interface 40, audio switch 42, dialer 60 and operator audio 66 are contained in the Modular Switching Peripheral device available from REDCOM LABORATORIES Inc.

The system 10 shown in FIG. 1 serves to automatically make telephone connections through lines 30 for providing dialing and eliminating busy and unanswered signals. The connected calls are provided to the operators at the terminals 14, 16 and 18. In a typical application the system 10 has approximately twice the number of telephone lines 30 as the number of operators.

The central controller 36 directs the operation of the multi-line control system 28 to make successful calls through the lines 30 and connect these calls to the appropriate ones to the operators through terminals 14, 16 and 18. When a call is successfully made, a non-busy operator is selected and the operator's headset is connected to the called line. The controller 36 then transmits an identification of the call and the selected operator to the host computer 12 which calls up a relevant display screen of information for the called party and directs it to the appropriate one of the display terminals 14, 16 and 18 for the selected operator. Thus, the operator is provided with an audio connection to a called party through one of the headsets 20, 22 and 24 and has displayed on one of the terminals 14, 16 and 18 detailed information concerning the called party. The operator's time is not consumed with the dialing of telephone numbers and the resulting time lost with busy lines and unanswered lines. There is further no time lost while the operator makes her request for display information following a successful connection to a called party.

The host computer 12 stores a record for each party to be called. This record includes a telephone number and additional relevant information for that party. The telephone numbers are transmitted as groups through the line 38 to the controller 36. When a called party answers, the host computer receives an indication of the successful connection from the controller 36. The host computer 12 then selects the corresponding relevant information and transmits it to the appropriate one of the display terminals.

The detailed operation of the central controller 36 is now described in reference to FIG. 2. The operational description in FIG. 2 is described in reference to a single one of the telephone lines 30. This functional operation is carried out concurrently for each one of the telephone lines 30. The operation begins at a start point 80. In a first operational block 82 there is a transfer of a group of telephone numbers from the host computer 12 to the controller 36. These telephone numbers are placed in a host queue. In a sequential operational block 84, one of the telephone lines 30 is seized for placing a call. From the block 84 control goes to a decision block 86 to detect a dial tone on the selected line. If no dial tone is detected a decision block 88 is entered to determine if five seconds have elapsed since looking for dial tone began. If the five seconds has not elapsed the control is returned through a NO line to the input of the decision block 86. After five seconds has elapsed with no dial tone, control is transferred through a YES line to an operational block 90 which indicates that there is an error due to no dial tone, meaning that the line is dead. In the next operational block 92 a report is made by the controller 36 for the selected line to the host computer 12. From block 92 control is transferred to a disconnect line operational block 94 which disconnects the interface 40 from the selected line and returns control to the operational block 84 to seize a new telephone line and start a new dialing sequence.

If a dial tone is detected at decision block 86, control is transferred through the YES line to an operational block 100 which selects the next phone number from the host queue and dials this number at the selected line. From operational block 100 control enters a decision block 102, which examines the line for a busy signal. This operation is carried out by the signal detect circuit 52. If a busy signal is detected at block 102, control is transferred through the YES line to an operational block 104 to indicate a busy line. From block 104 control is transferred to an operational block 106 to report the busy line status to the host computer 12. Control is then transferred back to block 94 to disconnect the line and resume the call sequence at block 84.

If a busy signal is not detected at the decision block 102, control is transferred through the NO line to a decision block 108 for detection of a ring. If a ring is not detected, control is transferred through the NO line to a decision block 110 for detection of voice. A voice signal is detected through the selected line by operation of the signal detect circuit 52. If a voice is not detected on the called line, control is transferred through the NO line to a decision block 112 to determine if thirty seconds has elapsed since the call has been placed. If thirty seconds has not elapsed, control is transferred through the NO line and back to the decision block 102 for further examination of the line for detection of a busy signal. If thirty seconds has elapsed, control is transferred through the YES line to an operational block 114 which determines that there is a dead line error and an appropriate report is sent to the host computer 12. From block 114 control is transferred to the disconnect line block 94 to resume the calling sequence with a new number starting with block 84.

If a voice is detected at block 110 then, most likely, there is a recording being played on the line since there was never a ring. Control is transferred through the YES response to an operational block 116 for indicating detection of a recording. Control is next transferred to an operational block 118 to report the phone number and a recording status to the host computer 12. From block 118 control is passed to block 94 for line disconnect then to block 94 to start a new call sequence.

If the ring detection at decision block 108 indicates that there is a ring, control is transferred through the YES line to a decision block 120 for detection of an answer at the called line. Voice detection is carried out by the signal detect circuit 52. If there is no answer, control is transferred through the NO line to a decision block 122 to determine if four rings have occurred or if thirty seconds has elapsed. If this has not occurred, control is transferred through the NO line to reenter the examination for an answer at decision block 120. If the four rings or thirty seconds has occurred, control is transferred through the YES line to an operational block 123 to indicate no answer and then to an operational block 124 to report the status and phone number to the host computer 12 for the number that has been called but for which there has been no answer. Control is subsequently returned to the disconnect line block 94 for initiating another call sequence at the block 84.

If an answer is detected at the decision block 120, control is transferred through the YES response to a decision block 126 to determine if there is a free operator, that is, an operator not currently connected to a successfully placed call. If it is determined that there is no free operator, control is transferred through the NO response to an operational block 128 to play a hold message on the called line. This is carried out by the voice I/O 46. The message requests that the called

party hold for a brief period until an operator is available. From block 128 control is transferred to a decision block 130 which examines to determine if the hold message has been playing for more than thirty seconds. If it has not, control is transferred through the NO response to the input of the decision block 126 to determine again if there is an operator available to service the called line. If the hold message has been playing for more than thirty seconds, control is transferred through the YES response to an operational block 132 which plays a recorded message to the called party stating that the party will be called at a later time. From block 132 control is transferred to an operational block 134 which reports the status and the phone number to host computer 12 for the number of the party who was called but who was told that a call will be placed at a later time. From block 134 control is then returned to the operational block 94 to disconnect the line and resume the calling sequence of block 84.

If the decision block 126 determines that there is a free operator to service the answered call, control is transferred through the YES response to an operational block 140 which connects a free operator through the operator audio 66 to the called line which has been answered. In the next operational block 142, the controller 36 sends a message to the host computer 12 giving the telephone number which has been answered and the identification of the operator which has the corresponding audio headset connected to the called line.

The next operational block 144 is carried out by host computer 12 rather than the controller 36. The computer 12 calls up at least a portion of the record for the called line which has been answered. The selected portion of the record is then sent through line 26 to the appropriate one of the terminals 14, 16 or 18 which corresponds to the operator whose headset has been connected to the called line. The operator is thus provided with a display screen of information that is uniquely relevant to the called party. The operator can then follow the sequence of information on the screen for communicating with the called party. The operator can directly enter responses from the called party into the displayed record which then can be returned to the host computer 12 for storage and further processing.

From the operational block 144 control is transferred to a decision block 146 which examines the display terminal for the selected operator to determine if the operator has completed the conversation with the called party. If the operator has not indicated that the conversation is completed, the NO response transfers control back to the input of the decision block 146 to further examine if the call has been terminated. When the operator has indicated that the call has been completed, control is transferred through the YES response to an operational block 148 in which the host computer receives the termination signal from the operator and in turn transmits a report of termination specifying which operator or telephone number has completed the conversation and this information is transmitted to the controller 36. Blocks 146 and 148 are carried out by the host computer 12. From the operational block 148 control is then returned to the disconnect line block 94 for releasing the line for which the conversation has been completed. Control is then returned to the operational block 84 for initiating another call sequence with a new telephone line.

When the group of telephone numbers received from the host computer 12 has been exhausted, the central controller 36 can request a new group of telephone numbers to be called and establish a new host queue for continuing the calling operation. The busy and unanswered numbers can either be retried by the central controller 36 or be included in a new group of numbers to be called by the host computer 12.

The system 10 provides optium utilization of the pool of operators by queuing called parties by operation of the hold message provided through operational block 128. In an optimal situation all of the operators remain busy while the called parties are on hold for a minimum time. Should the number of persons who receive a message for a later callback or the hold time becomes excessive, the control system 28 reduces the rate of calls by either pausing between calls or stop calling on a line. This brings the number of answered calls closer in line with the availability of operators. But if there are a number of free operators available without answered lines for servicing, the control system 28 increases the number of calls by increasing the number of phone lines or reducing the pause between outgoing calls to supply answered lines for servicing by all of the available operators.

In summary, the present invention comprises a multiline calling system for automatically placing calls and eliminating the operator effort with busy and unanswered numbers. The successfully placed calls are reported to the host computer which produces a visual display to the operator who has received an audio connection to the successfully called party. The operator can then provide unique servicing to the called party.

Although one embodiment of the invention has been illustrated in the accompanying drawings and described in the foregoing Detailed Description, it will be understood that the invention is not limited to the embodiment disclosed, but is capable of numerous rearrangements, modifications and substitutions of parts and elements without departing from the scope of the invention.

What I claim is:

1. A method for providing a continuous sequence of telephone calls to a plurality of operators each having a display terminal and a bidirectional audio communications device wherein a plurality of records are stored in a host computer which drives the display terminals, each of the records including a telephone number and other information, comprising the steps of:

(a) transferring a plurality of stored telephone numbers from said host computer to a controller,

(b) placing each of a plurality of calls by dialing one of said numbers on an available one of a plurality of telephone lines in response to said controller,

(c) after the dialing of said one number, detecting a line condition other than busy or ring to indicate an answer to the call,

(d) for each call answer, connecting the answered one of the telephone lines to the audio communications device for a non-busy one of said operators,

(e) for each call answer, transferring an identification of the number at which the call was answered and the one operator having the connected line to said host computer,

(f) in response to said transferred identification of said number at which the call was answered and said one operator, said host computer transmits at least a part of the stored record corresponding to the telephone number for the answered call to the display device for said one operator whereby infor-

mation from said record is displayed to said one operator concurrent with said one operator having audio communication through said answered line, said one operator thereby being designated as busy until completion of the telephone call on the answered line, and

(g) repeating steps (b) through (f) attempting to keep all of said operators busy.

2. The method recited in claim 1 further including the step of placing said answered telephone lines on hold when there are no non-busy operators available to be connected to an answered telephone line.

3. The method recited in claim 1 wherein the number of said telephone lines is selected to be greater than the number of said operators.

4. A method for providing a continuous sequence of telephone calls to a plurality of operators each having a display terminal and a bidirectional audio communications device wherein a plurality of records are stored in a host computer which drives the display terminals, each of the records including a telephone number and other information, comprising the steps of:

(a) receiving a plurality of stored telephone numbers from said host computer by a controller, and placing said telephone numbers in a host queue,

(b) in response to said controller, dialing one number from said host queue of numbers on one of a plurality of telephone lines,

(c) after said dialing, detecting a line condition other than busy or ring to indicate an answer for the called number,

(d) for an answer for said called number, connecting the one line to the communications device for a non-busy one of said operators,

(e) following said answer, transferring by said controller an identification of said number at which the call was answered and of said one operator to said host computer,

(f) in response to said transferred identification, said host computer transferring at least a part of the record corresponding to the number at which the call was answered to the display terminal for the one operator whereby information from said record is displayed concurrently with said one operator having audio communications through said answered line,

(g) receiving at said controller an indication that said one operator has terminated a conversation through said answered line, and

(h) disconnecting said answered line upon receipt of said termination indication.

5. The method recited in claim 4 further including the step of placing said answered telephone lines on hold when there are no non-busy operators available to be connected to an answered telephone line.

6. The method recited in claim 4 further including the step of reporting to said host computer, together with the dialed telephone number, line conditions other than answer.

* * * * *

UNITED STATES PATENT

4,933,964

United States Patent [19]

Girgis

[11] **Patent Number: 4,933,964**

[45] **Date of Patent: Jun. 12, 1990**

[54] **PACING OF TELEPHONE CALLS FOR CALL ORIGINATION MANAGEMENT SYSTEMS**

[75] Inventor: **Bassem M. Girgis, Burke, Va.**

[73] Assignee: **International Telesystems Corporation, Herndon, Va.**

[21] Appl. No.: **385,015**

[22] Filed: **Jul. 25, 1989**

[51] Int. Cl.[5] **H04M 1/276; H04M 3/46**

[52] U.S. Cl. **379/67; 379/69; 379/216**

[58] Field of Search **379/67, 88, 92, 69, 379/216, 218**

[56] **References Cited**

U.S. PATENT DOCUMENTS

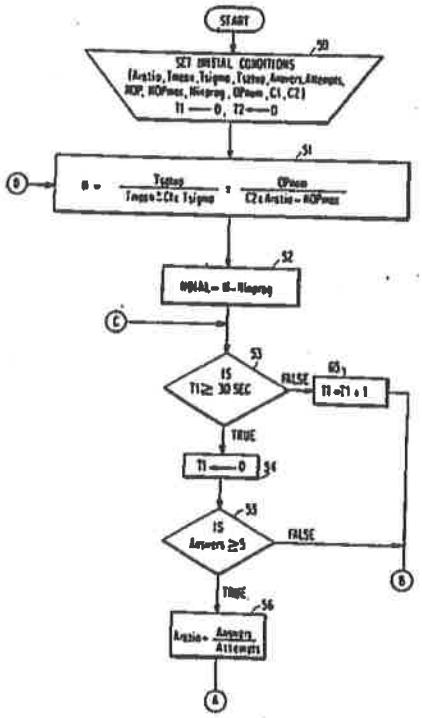
4,599,493	7/1986	Cave	379/247
4,797,911	1/1989	Szlam et al.	379/67
4,817,130	3/1989	Frimmel, Jr.	379/88

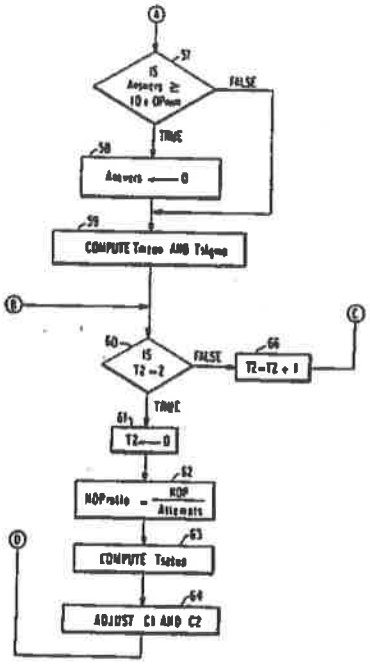
Primary Examiner—Thomas W. Brown
Attorney, Agent, or Firm—Whitham & Marhoefer

[57] **ABSTRACT**

An adaptive pacing algorithm based on a statistical analysis of the times of calls is used to determine when and how many calls to dial in a call origination management system. This pacing algorithm determines the number of calls to dial as an inverse function of the mean time of all calls and the standard deviation multiplied by a first constant. This first constant is a function of the ratio of nuisance calls to the number of call attempts and is not defined as a mathematical function but is, instead, determined experimentally to be ±0.25 of the standard deviation and varies depending on how far the ratio of nuisance calls deviates from a set level. The number of calls to dial is also an inverse function of a second constant times the ratio of the answered calls to the call attempts per session minus the maximum allowable nuisance calls. This second constant is itself a function of the mean time, ratio of answered calls to the number of call attempts during the session and the ratio of nuisance calls to the number of call attempts, but is has been determined empirically. As the session progresses, new values of the ratio of answered calls to attempts per session, the mean time and the standard deviation are computed, and these new values are used in determining the number of calls to dial.

18 Claims, 18 Drawing Sheets





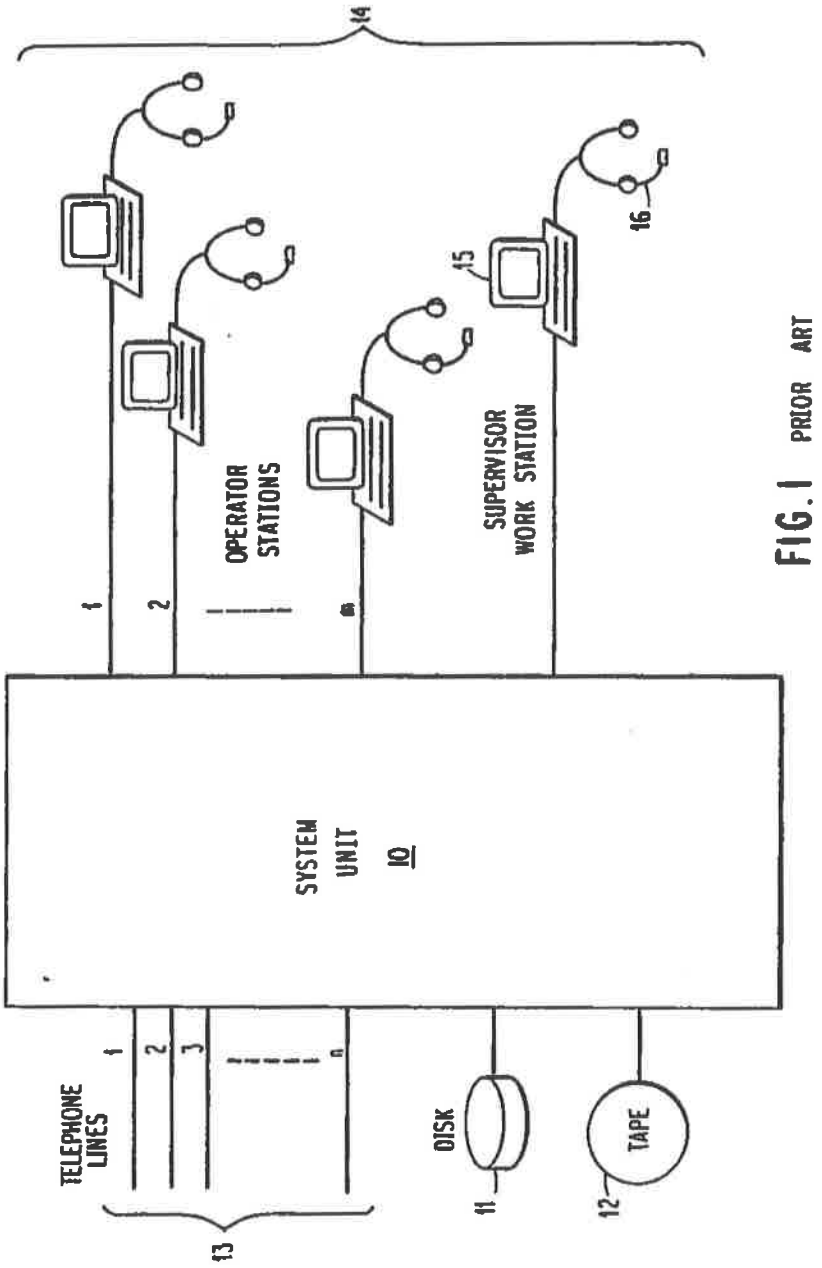


FIG. 1 PRIOR ART

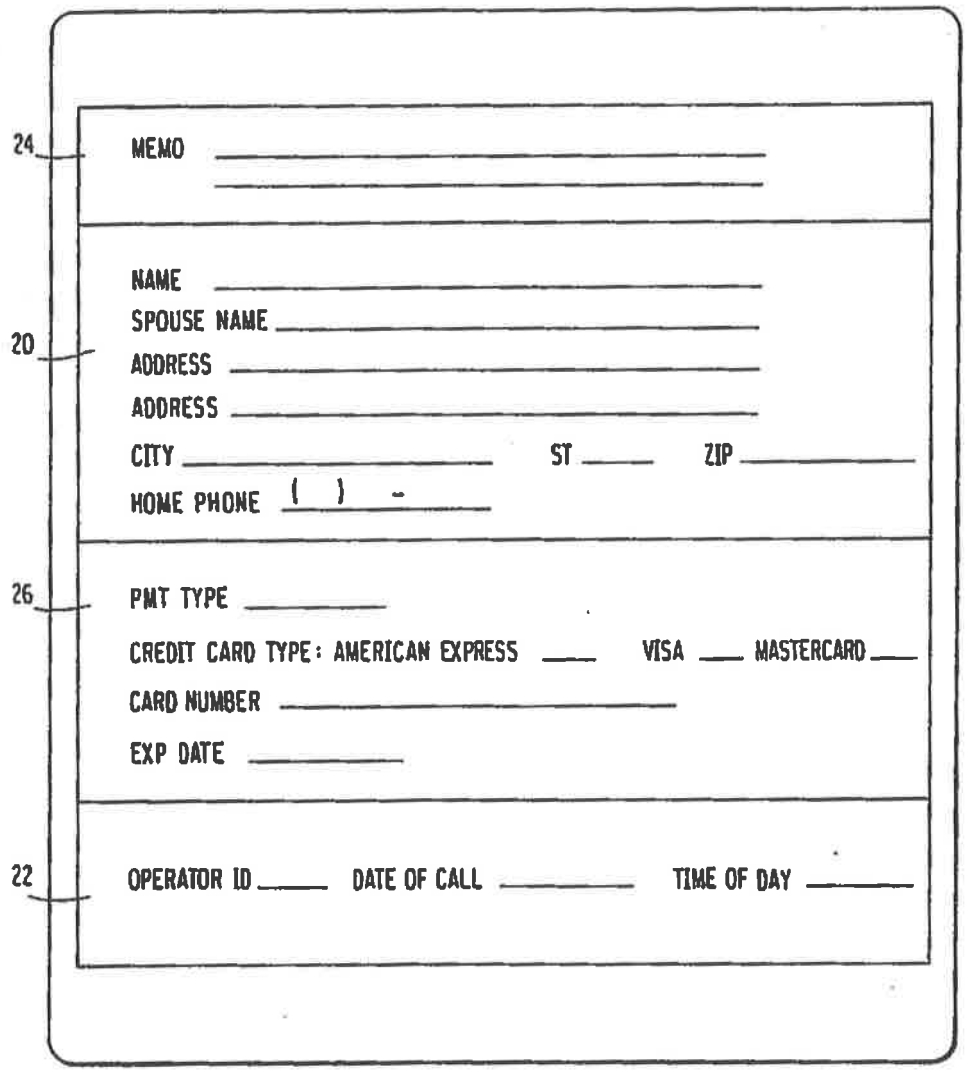

24
MEMO
20
NAME
SPOUSE NAME
ADDRESS
ADDRESS
CITY
ST
ZIP
HOME PHONE ( ) -
26
PMT TYPE
CREDIT CARD TYPE: AMERICAN EXPRESS
VISA
MASTERCARD
CARD NUMBER
EXP DATE
22
OPERATOR ID
DATE OF CALL
TIME OF DAY

FIG. 2

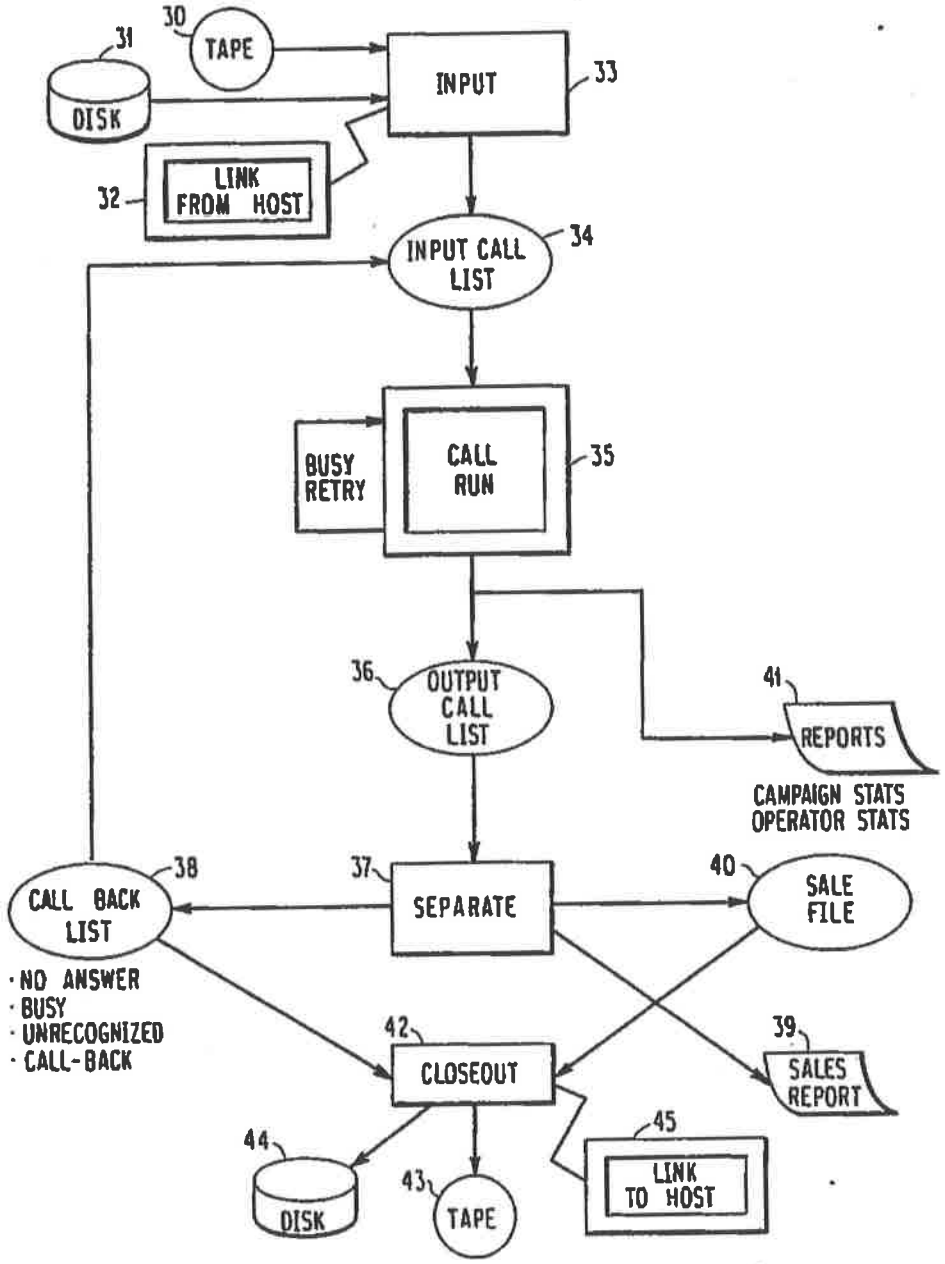
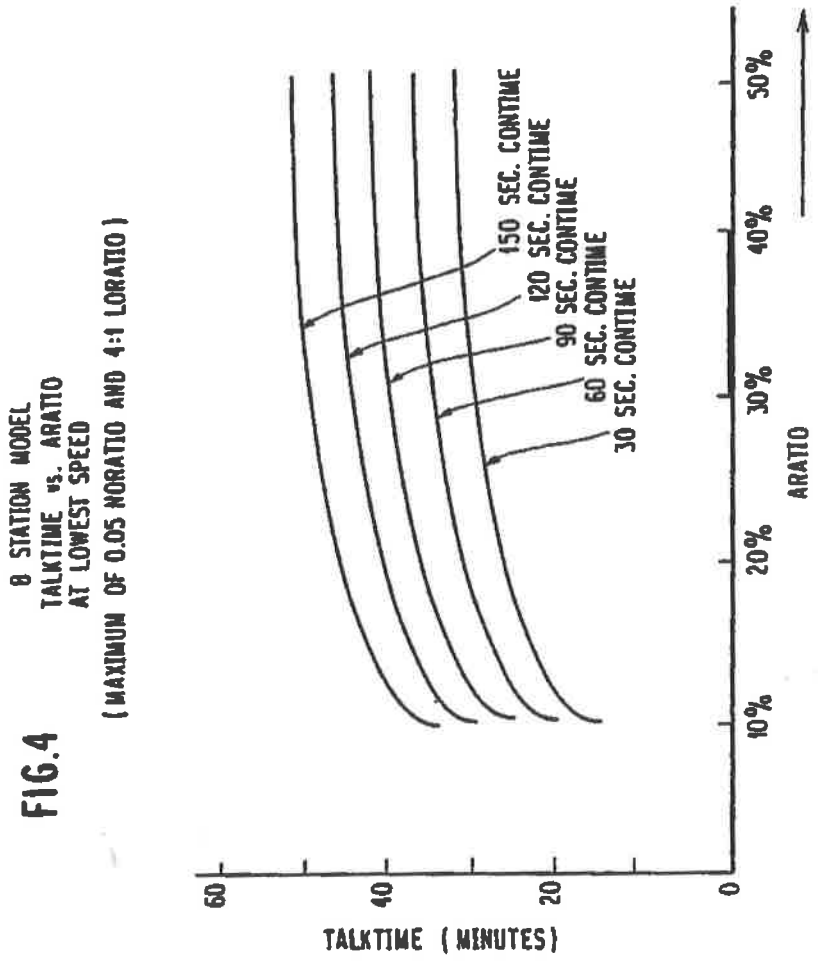


FIG. 3 PRIOR ART


8 STATION MODEL
TALKTIME vs. ARATIO
AT LOWEST SPEED
(MAXIMUM OF 0.05 NORATIO AND 4:1 LORATIO)
150 SEC. CONTIME
120 SEC. CONTIME
90 SEC. CONTIME
60 SEC. CONTIME
30 SEC. CONTIME
50%
40%
30%
20%
10%
ARATIO
60
40
20
0
TALKTIME (MINUTES)

F16.4

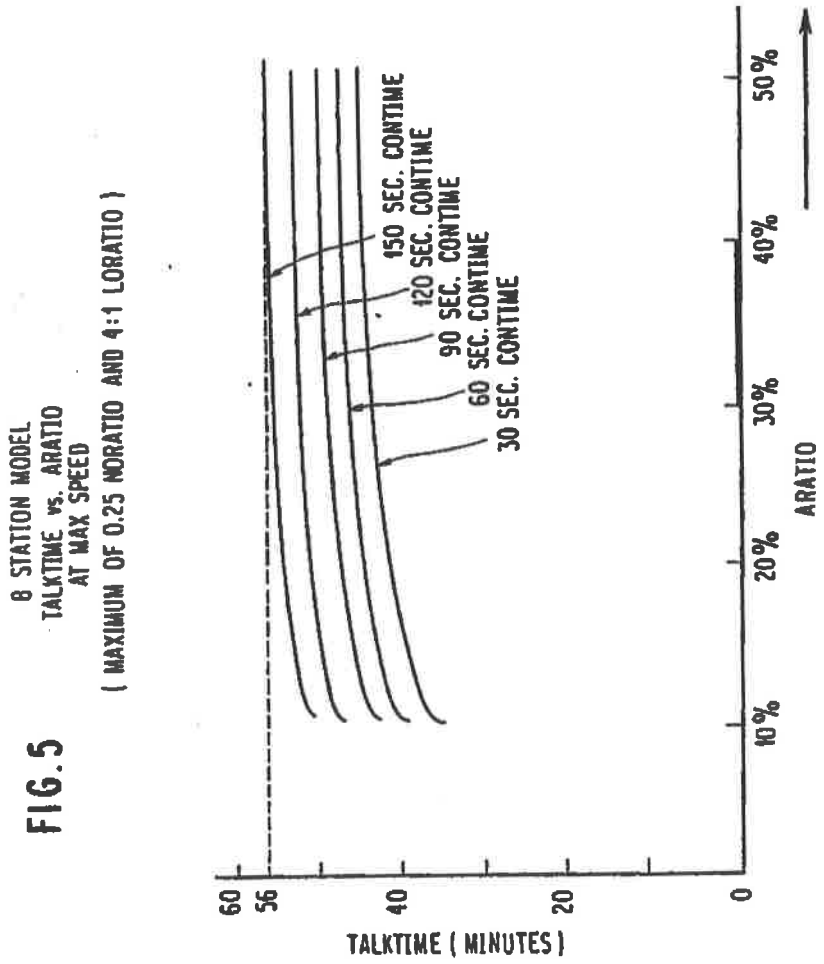

8 STATION MODEL
TALKTIME vs. ARATIO
AT MAX SPEED
(MAXIMUM OF 0.25 NORATIO AND 4:1 LORATIO)
150 SEC. CONTIME
120 SEC. CONTIME
90 SEC. CONTIME
60 SEC. CONTIME
30 SEC. CONTIME
50%
40%
30%
20%
10%
ARATIO
60
56
40
20
0
TALKTIME (MINUTES)

FIG. 5

FIG. 6

8 STATION MODEL
TALKTIME vs. ARATIO FOR DIFFERENT LINE/OPERATOR RATIOS
CONTIME IS APPROXIMATELY 30 SECONDS

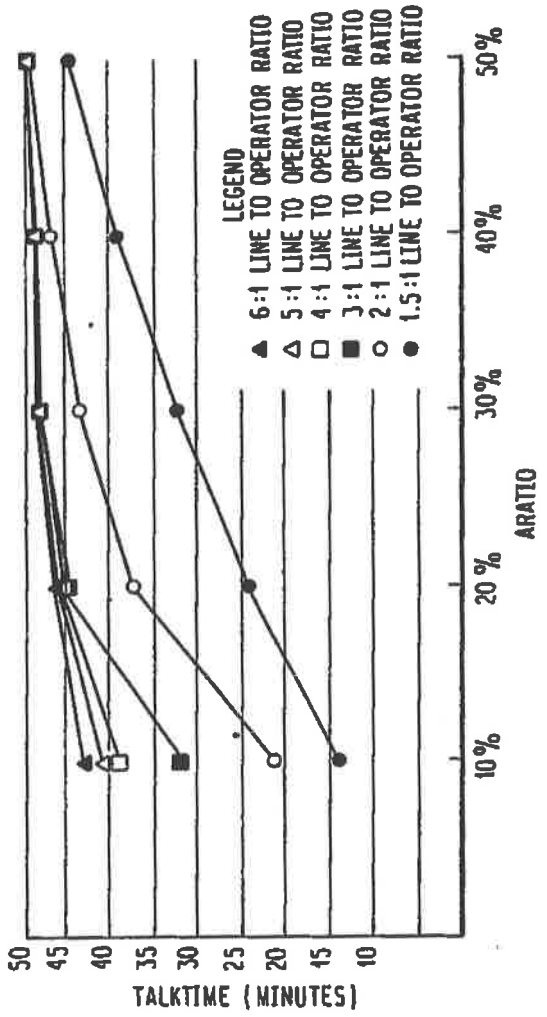


FIG.7

8 STATION MODEL
TALKTIME vs. ARATIO FOR DIFFERENT LINE/OPERATOR RATIOS
CONTIME IS APPROXIMATELY 60 SECONDS

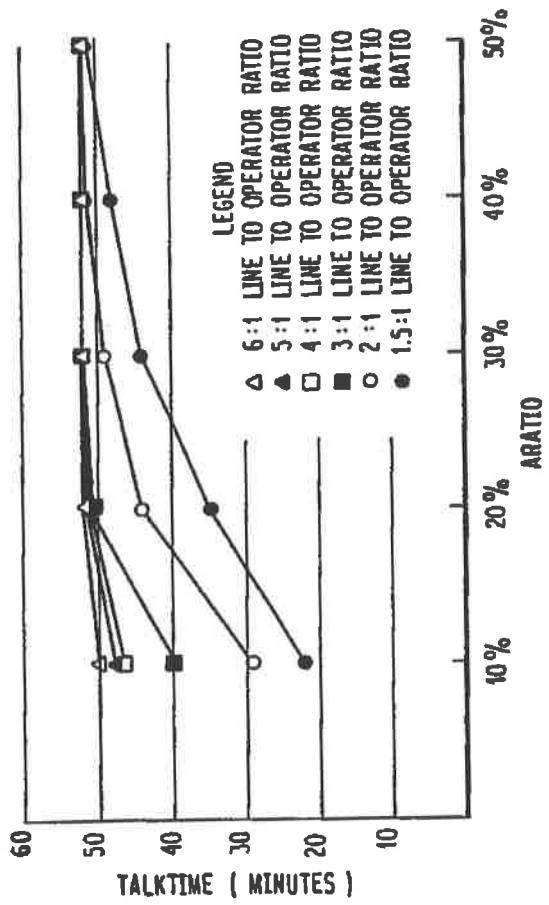


FIG. 8

8 STATION MODEL
TALKTIME vs. ARATIO FOR DIFFERENT LINE/OPERATOR RATIOS
CONTIME IS APPROXIMATELY 90 SECONDS

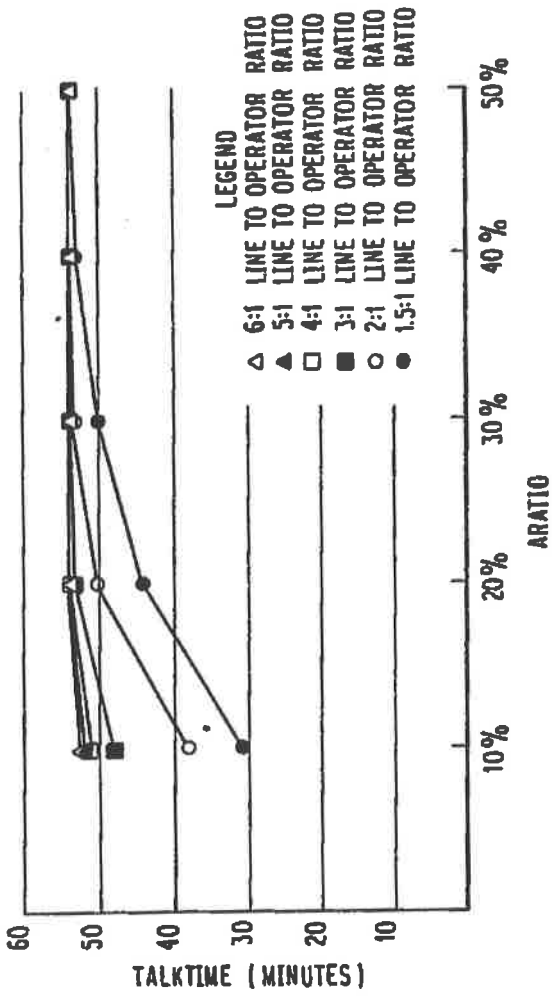
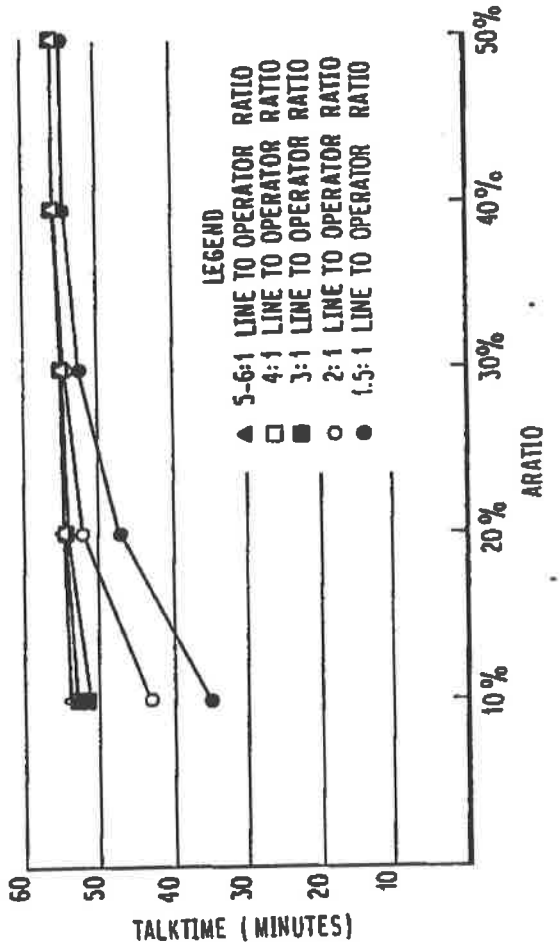


FIG. 9

8 STATION MODEL
TALKTIME vs. ARATIO FOR DIFFERENT LINE/OPERATOR RATIOS
CONTIME IS APPROXIMATELY 120 SECONDS



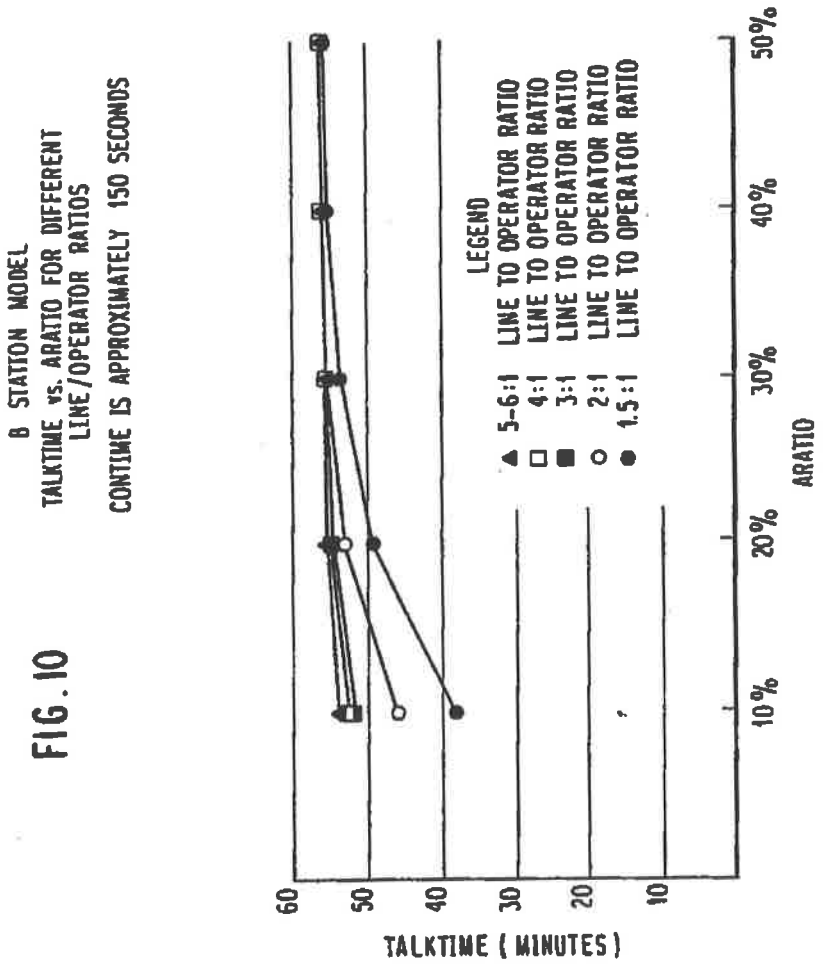
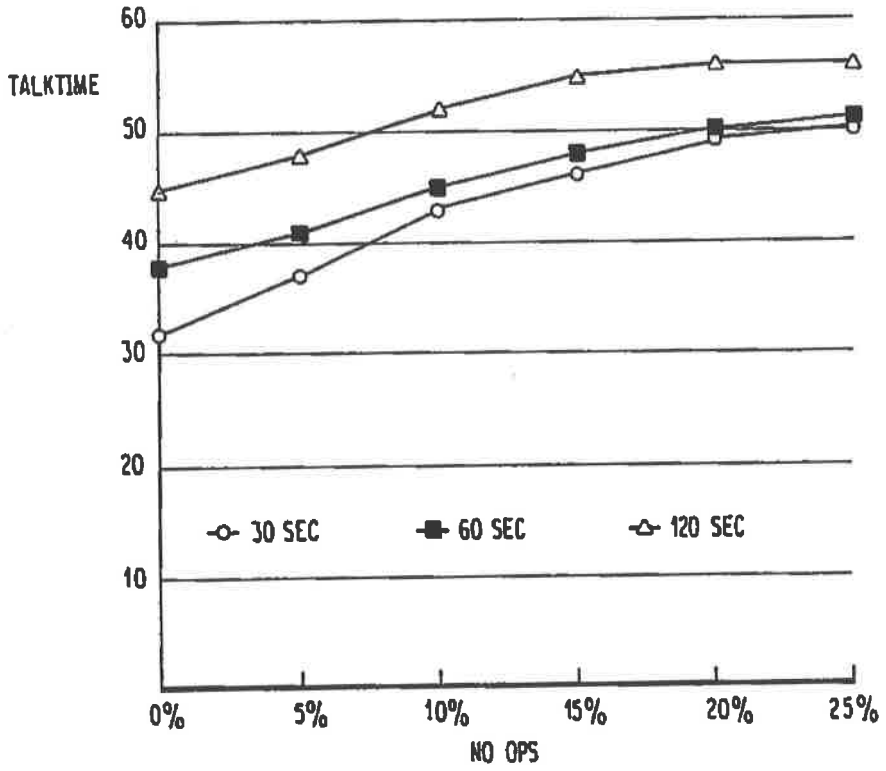

B STATION MODEL
TALKTIME vs. ARATIO FOR DIFFERENT LINE/OPERATOR RATIOS
CONTIME IS APPROXIMATELY 150 SECONDS
LEGEND
▲ 5-6:1 LINE TO OPERATOR RATIO
□ 4:1 LINE TO OPERATOR RATIO
■ 3:1 LINE TO OPERATOR RATIO
○ 2:1 LINE TO OPERATOR RATIO
● 1.5:1 LINE TO OPERATOR RATIO
ARATIO
10%
20%
30%
40%
50%
60
50
40
30
20
10
TALKTIME (MINUTES)

FIG. 10

FIG. 11


TALKTIME
60
50
40
30
20
10
30 SEC
60 SEC
120 SEC
0%
5%
10%
15%
20%
25%
NO OPS

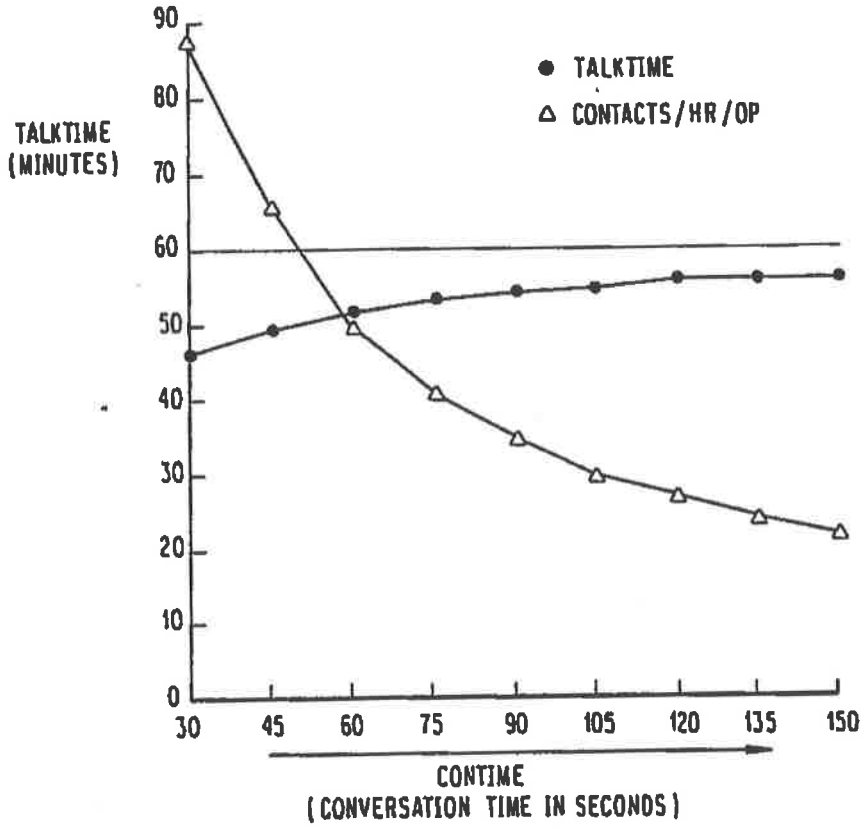

TALKTIME
CONTACTS/HR/OP
TALKTIME (MINUTES)
90
80
70
60
50
40
30
20
10
0
30
45
60
75
90
105
120
135
150
CONTIME
(CONVERSATION TIME IN SECONDS)

FIG. 12

FIG. 13

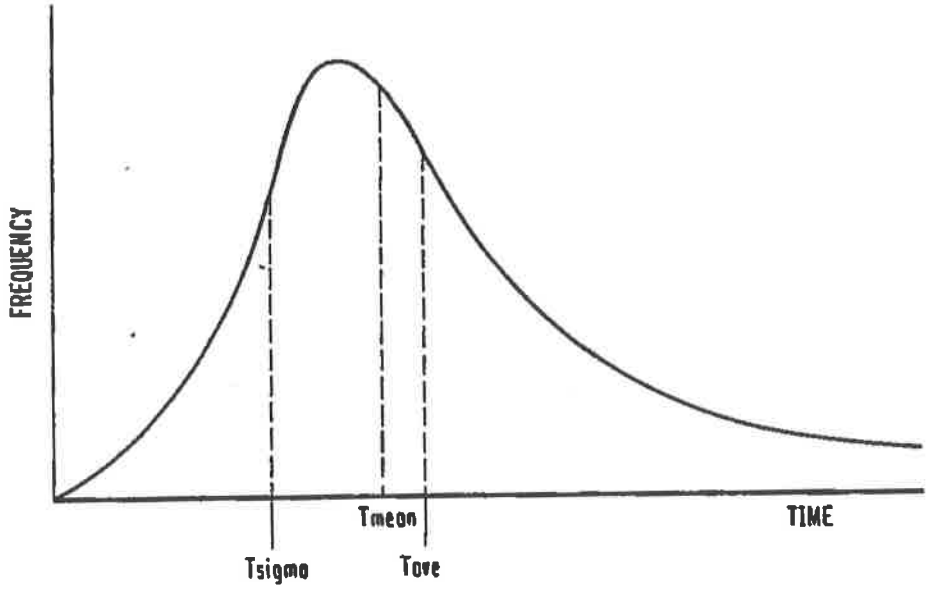
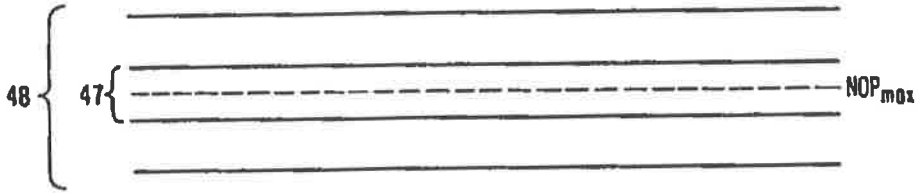


FIG. 14



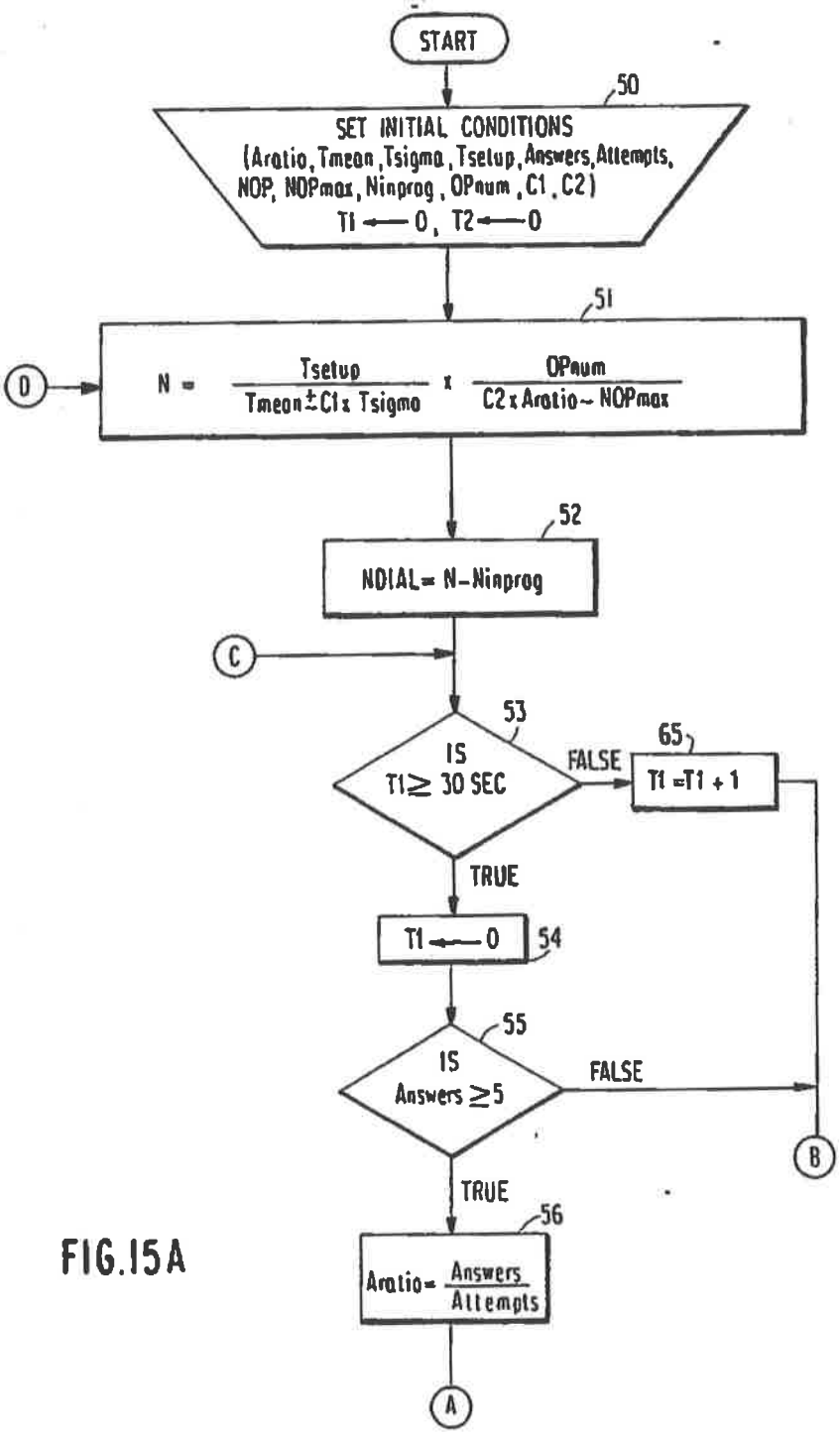

START
50
SET INITIAL CONDITIONS
(Aratio, Tmean, Tsigma, Tsetup, Answers, Attempts,
NOP, NOPmax, Ninprog, OPnum, C1, C2)
T1 ← 0, T2 ← 0
51
D
N = Tsetup / (Tmean ± C1 x Tsigma) x OPnum / (C2 x Aratio - NOPmax)
52
NDIAL = N - Ninprog
C
53
IS T1 ≥ 30 SEC
FALSE
65
T1 = T1 + 1
TRUE
T1 ← 0
54
55
IS Answers ≥ 5
FALSE
B
TRUE
56
Aratio = Answers / Attempts
A

FIG.15A

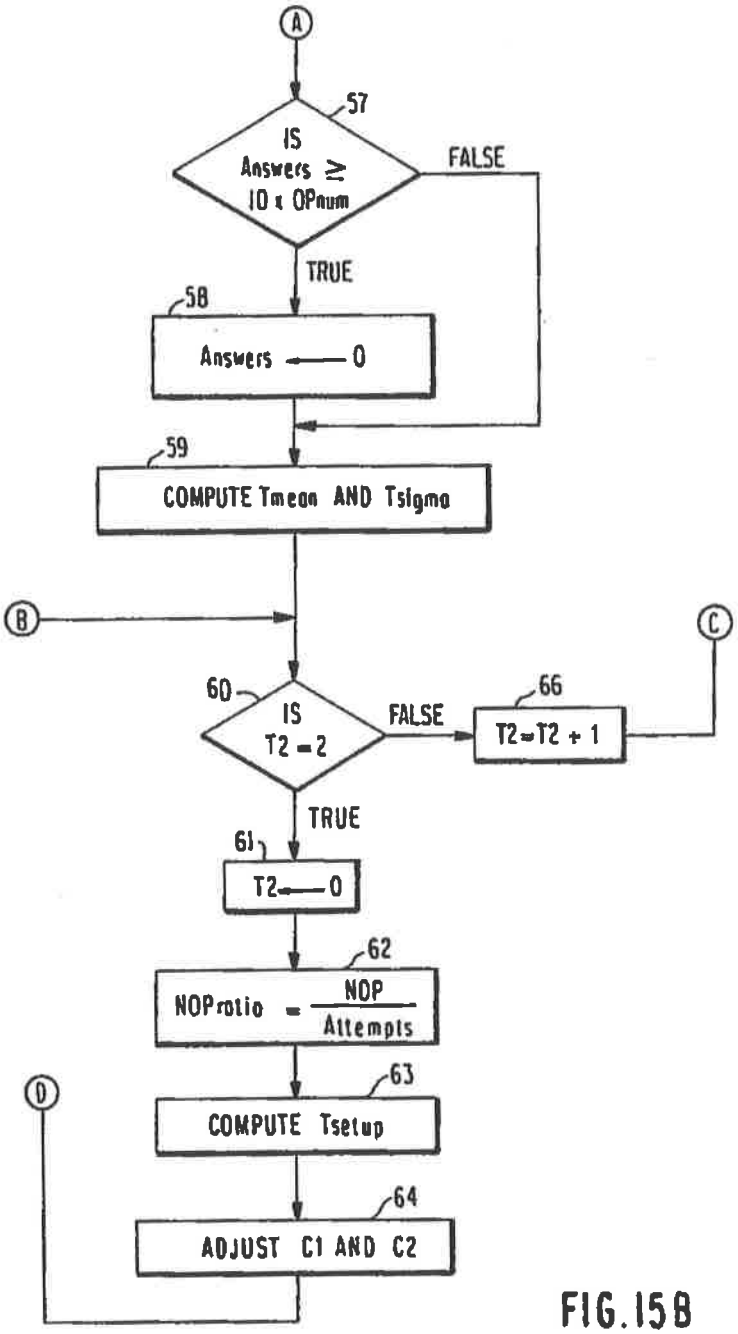

A
57
IS
Answers ≥
10 x OPnum
FALSE
TRUE
58
Answers ← 0
59
COMPUTE Tmean AND Tsigma
B
C
60
IS
T2 = 2
FALSE
66
T2=T2 + 1
TRUE
61
T2 ← 0
62
NOPratio = NOP / Attempts
D
63
COMPUTE Tsetup
64
ADJUST C1 AND C2

FIG.15B

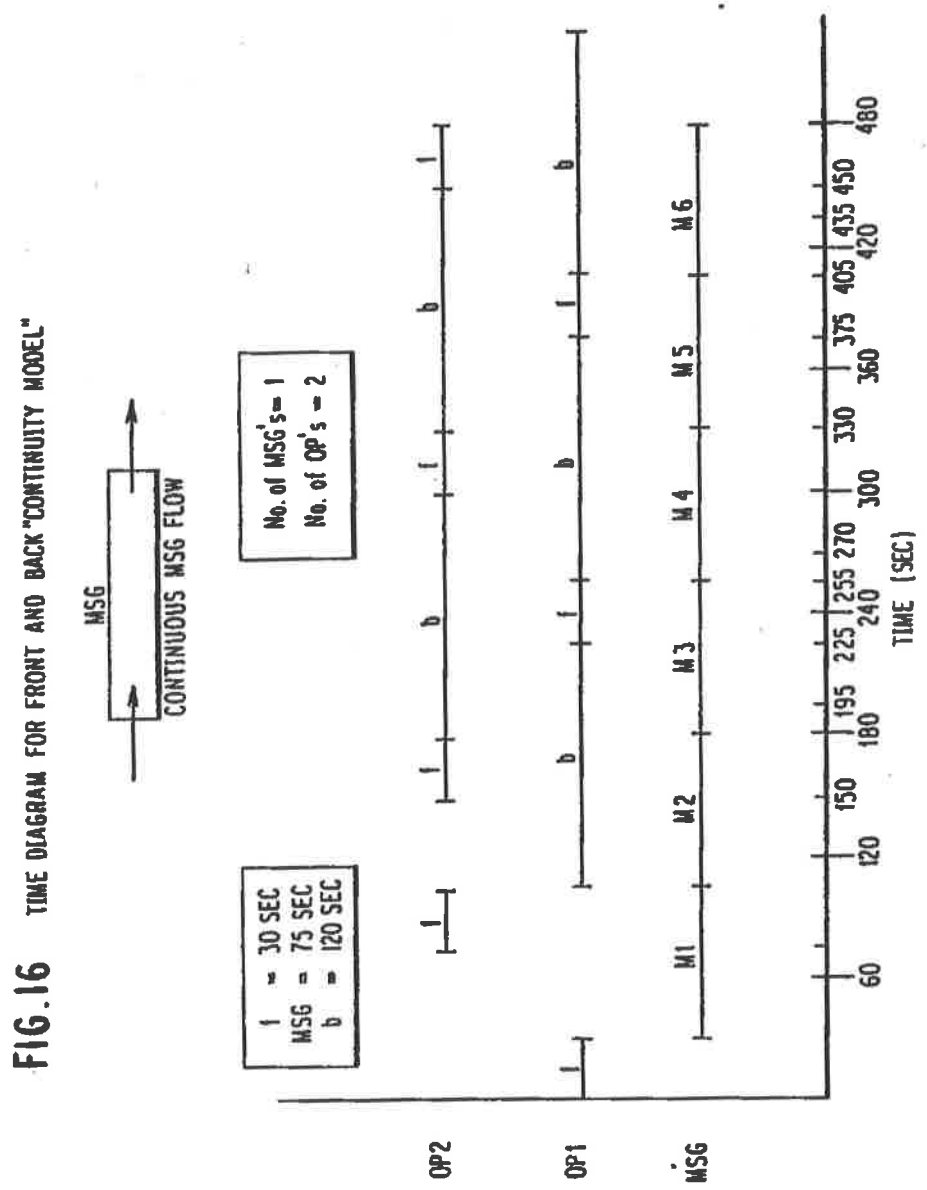


FIG. 16 TIME DIAGRAM FOR FRONT AND BACK "CONTINUITY MODEL"

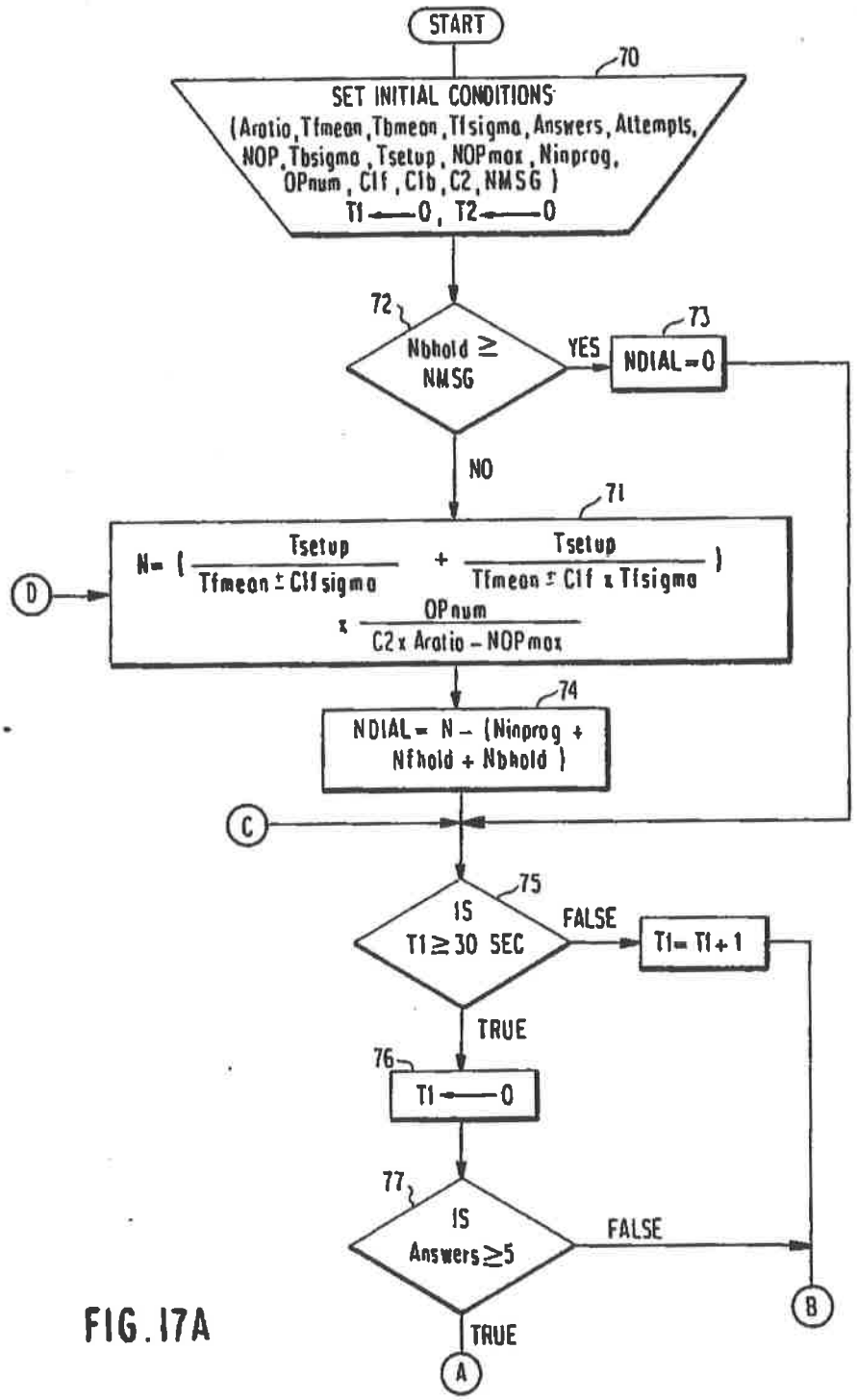

START
70
SET INITIAL CONDITIONS
(Arotio, Tfmean, Tbmean, Tfsigma, Answers, Attempts, NOP, Tbsigma, Tsetup, NOPmax, Ninprog, OPnum, C1f, C1b, C2, NMSG)
T1 ← 0, T2 ← 0
72
Nbhold ≥ NMSG
YES
73
NDIAL = 0
NO
71
N = (Tsetup / Tfmean ± C1f sigma + Tsetup / Tfmean ± C1f x Tfsigma) x OPnum / C2 x Arotio − NOPmax
D
74
NDIAL = N − (Ninprog + Nfhold + Nbhold)
C
75
IS T1 ≥ 30 SEC
FALSE
T1 = T1 + 1
TRUE
76
T1 ← 0
77
IS Answers ≥ 5
FALSE
TRUE
B
A

FIG. 17A

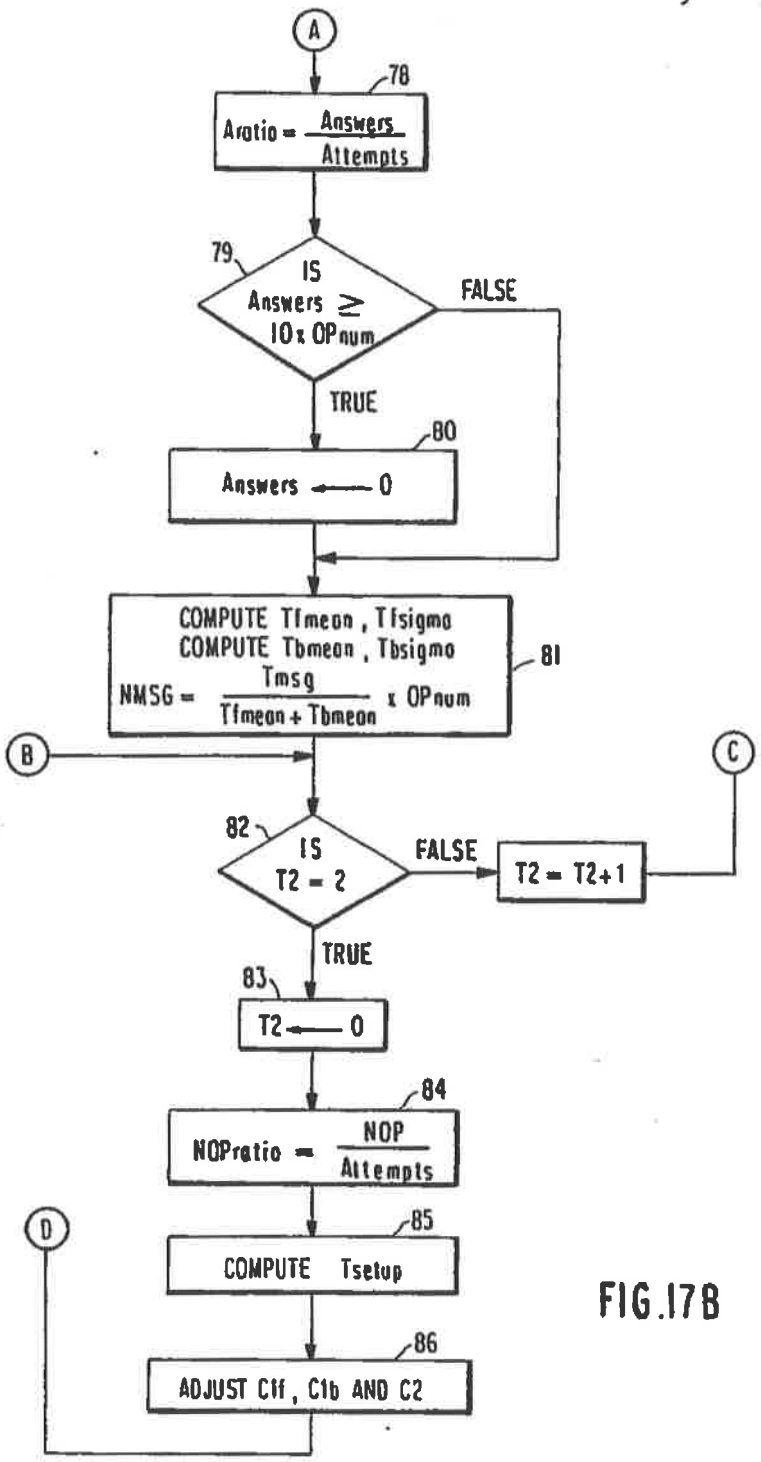

A
78
Aratio = Answers / Attempts
79
IS Answers ≥ 10 x OPnum
FALSE
TRUE
80
Answers ← 0
COMPUTE Tfmean, Tfsigma
COMPUTE Tbmean, Tbsigma
NMSG = Tmsg / (Tfmean + Tbmean) x OPnum
81
B
C
82
IS T2 = 2
FALSE
T2 = T2+1
TRUE
83
T2 ← 0
84
NOPratio = NOP / Attempts
D
85
COMPUTE Tsetup
86
ADJUST C1f, C1b AND C2

FIG.17B

PACING OF TELEPHONE CALLS FOR CALL ORIGINATION MANAGEMENT SYSTEMS

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention generally relates to call origination management systems of the type wherein telephone calls are automatically dialed and, when a call results in an answer, transferred to an available operator. More particularly, the invention is directed to an improved pacing system which regulates the rate at which calls are dialed to maximize the time an operator talks to clients and to minimize the number of answered calls for which there is no operator available.

Description of the Prior Art

Automated calling systems which dial clients, listens for the call result (i.e., ringing, busy signal, answer, no answer, etc.), and when a call results in an answer, automatically transfers the call to an available operator are in general use today by a variety of businesses, groups and organizations. For example, banks and other creditors use these systems for debt collection, publishers use them for soliciting subscriptions, and charitable and political organizations use them to promote their causes and solicit funds. In all these cases, the client contact is by an operator whose job is to deliver the message, answer questions and input data to the system. The purposes of such call origination management systems are to automate the process of calling clients and to process the data input in the course of a call with a client, thereby increasing the productivity of the operators.

FIG. 1 shows a system overview of one such system. The heart of the system is a main system unit 10, which typically includes central processing unit (CPU), telephone line control unit (LCU), hard disk storage 11, and a tape drive 12. A plurality of outbound telephone lines 13 are connected to the system unit 10. The number n of these outbound telephone lines typically is on the order of 48, but may be more or less depending on the specific application. A plurality of voice and data terminal stations 14 are also connected to the system unit 10. The number m of these voice and data terminal stations may be, for example, 24 for the case where the number n of the telephone lines is 48. In other words, the number m of the voice and data terminals is less than the number of telephone lines. This allows the system unit 10 to dial calls while all operators are busy talking to clients.

As illustrated in FIG. 1, each of the voice and data terminal stations comprises a combination video display terminal (VDT) and keyboard 15 and a telephone headset and microphone 16. FIG. 2 illustrates a typical operator screen as displayed by the video display terminal. When a call is transferred to an operator, a portion of this screen will already have been filled in by the CPU in the main system unit 10. Specifically, section 20 of the screen providing the name, address and telephone number of the client will have been filled in so that the operator knows immediately who has been called. During the course of the conversation, the operator may confirm the data and, if necessary, make corrections using the keyboard. Section 22 of the screen is also filled in automatically by the CPU based on the login data from the operator at the beginning of the campaign and the CPU's clock and calendar. The top portion 24 of the screen is available to be filled in by the operator with any pertinent information from the contact with the client. In addition, where a bill is to be paid or a pledge made that is to be charged to a credit card, the operator would fill in portion 26 of the screen during the call.

FIG. 3 illustrates the data flow of the system. The first step in beginning a calling campaign is to obtain the calling data, typically via tapes 30, disks 31 or through a communication link to a host computer 32. The data is input at 33, and the system then organizes the data into the records for the campaign. When the campaign is started, the data is loaded into the "input call list", as indicated at 34. The system then preloads a dialing queue 35 with a certain number of records from the calling data. As the dialing process begins, the system manages the number of calls being made at any one time based on the number of operators that are available to receive calls. When a connection is established to a client, the system routes the call to an available operator and displays the client's record on the operator screen. The operator is now ready to make the presentation to the client and record information from the transaction on the display screen. Once the operator completes the call, he or she presses a designated key on the keyboard to record the status of the contact and terminate the call. The system then makes the operator station available for another call.

After the operator has pressed the designated key, the system validates the client's record in an output call list 36, and, depending on the outcome of the call, separates the record in the corresponding output file at 37. For example, if the particular person to be contacted is not at home, the operator may press a key telling the system to place the client's record into the call-back file 38. When, for example, a call results in a future follow-up call, the operator presses another key to immediately print information of the transaction on a printer, as indicated at 39. Records which require no further action (i.e., a sale is made, wrong number, etc.) are marked complete and are not put into the call-back file but instead are put in a sale file 40.

When all the numbers have been exhausted in the campaign list, the system automatically begins a statistical analysis of both operator and campaign performance, as indicated at 41. Finally, a closeout function 42 is performed during which all relevant data of the campaign is written to a tape 43 or disk 44 or transmitted to a host computer 45.

A key to the successful operation of a call origination management system of the type described is the pacing algorithm which calculates the number of calls to dial and the best estimate of the time when to dial them. In the prior Trunk Operation Management System (TOMS), which is a predictive outbound dialing system, the dialer uses a pacing algorithm based on cumulative statistics that are periodically refreshed. The goal of this system is to maximize efficiency, as measured by the amount of talk time with clients, with a minimum number of resources (i.e., the telephone trunk lines) while at the same time minimizing the number of nuisance calls. Nuisance calls are those calls that result in an answer by a client but, because an operator was unavailable, the system must hang up on the client.

An example of this prior system is described in application Ser. No. 07/027,359 filed by Douglas A. Samuelson on Mar. 18, 1987, and assigned to the assignee of this application, now Pat. No. 4,858,120. The Samuelson system analyzed the problem based on queuing theory, which is not actually applicable in a call origination

system since the system has control of when telephone numbers are dialed. Samuelson did attempt to statistically analyze various parameters of the calling process and, based on that analysis, predict the number of calls and when the calls should be made. However, in practice, it has been found that the system, while working well for some applications, worked poorly in other applications. That is, in some cases, the efficiency was high and the number of nuisance calls acceptably low, while in other cases, the efficiency was either low or the number of nuisance calls were unacceptably high or both.

SUMMARY OF THE INVENTION

It is therefore a general object of the present invention to provide an improved pacing algorithm for telephone call origination management systems.

It is a another object of the invention to provide an adaptive pacing algorithm based on a statistical analysis of the tiimes of calls to determine when and how many calls to dial.

It is further object of the invention to provide a nonqueuing call origination management system in which the efficiency of operation is significantly increased while at the same time the number of nuisance calls is dramatically reduced.

Yet another object of the invention is to provide an improved pacing algorithm for a call origination management system which can be tailored to specific applications.

According to one aspect of the invention, a nonqueuing pacing algorithm has been developed based on statistical analyses of call origination management systems. This nonqueuing pacing algorithm determines the number of calls to dial as an inverse function of the mean time of all calls and the standard deviation multiplied by a first constant. This first constant is a function of the ratio of nuisance calls to the number of call attempts and is not defined as a mathematical function but is, instead, determined experimentally to be ± 0.25 of the standard deviation and varies depending of how far the ratio of nuisance calls deviates from a set level. The number of calls to dial is also an inverse function of a second constant times the ratio of the answered calls to the call attempts per session minus the maximum allowable nuisance calls. This second constant is itself a function of the mean time, ratio of answered calls to the number of call attempts during the session and the ratio of nuisance calls to the number of call attempts, but it has been determined empirically.

The basic nonqueuing algorithm according to the first aspect of the invention may be applied to queuing call origination management systems to obtain improved results. In queuing systems, there are by definition no nuisance calls. Instead, answered calls for which no operator is available are routed to a source of a recorded message. It is desireable, however, in such queuing systems to minimize the number of answered calls which must be routed to the source of a recorded message and, therefore, the techniques of the basic algorithm are directly applicable to queuing call origination management systems. The waiting time in the queue is directly related to the number of answered calls which are routed to the source of a recorded message; i.e., the higher the number of clients on hold the longer a client will be on hold and the higher the probability of a client hanging up while on hold. The number of clients on hold is subtracted from the calculated number of calls to dial.

The basic algorithm and another algorithm are useful in front and back call origination managements systems. Such systems are especially useful for soliciting donations to charitable and political organizations and employ "front" operators who make the initial contact with clients. The front operators identify the campaign and ask the client whether they would be willing to listen to a recorded message from, say, their Senator or other important individual. If they get an affirmative response, the front operator switches the call to a source of recorded message, and the front operator is then connected to the next answered call. At the end of the recorded message, the call management system switches the client to a "back" operator who then solicits a contribution or pledge, taking credit card and other pertinent information from the client. For the sake of simplicity, this description assumes designated "front" and "back" operators, but in practice, any operator may work either as a front or back operator as determined by the call management system.

Because of the nature of the campaign, the call origination management system, as a practical matter, should be a nonqueuing system for generating the calls to the front operators; however, there are applications where the call origination management system may be a queuing system. Thus, the basic pacing algorithm according to the invention, with or without queuing, is used for placing the calls to be handled by the front operators. The connect time for the front operators is, by its nature, uniformly quite brief, and the algorithm is adjusted accordingly. The connect time for the back operators, however, is much longer and less predictable. Therefore, a new algorithm, based on a continuity model, has been developed to account for the clients in the "queue" listening to the recorded message. If there is no restriction on the operators handling any type of calls (front or back), the algorithm calculates the number of calls to be dialed based on the number of front and back operators who are expected to become free.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other objects, aspects and advantages will be better understood from the following detailed description of a preferred embodiment of the invention with reference to the drawings, in which:

FIG. 1 is a high level block diagram showing an overview of a typical telephone call origination management system;

FIG. 2 is an illustration of a typical screen which may be displayed on a video display terminal for viewing and filling in by an operator;

FIG. 3 is a data flow diagram illustrating the processes performed by the telephone call origination management system of FIG. 1;

FIG. 4 is a family of graphs showing talk time as a function of the answer ratio for various values of connect, time at lowest speed for an eight station model.

FIG. 5 is a family of graphs showing talk time as a function of the answer ratio for various of values of connect time at maximum speed for an eight station model;

FIG. 6 is a family of graphs showing talk time as a function of the answer ratio for various line to operator ratios for a connect time of approximately 30 seconds;